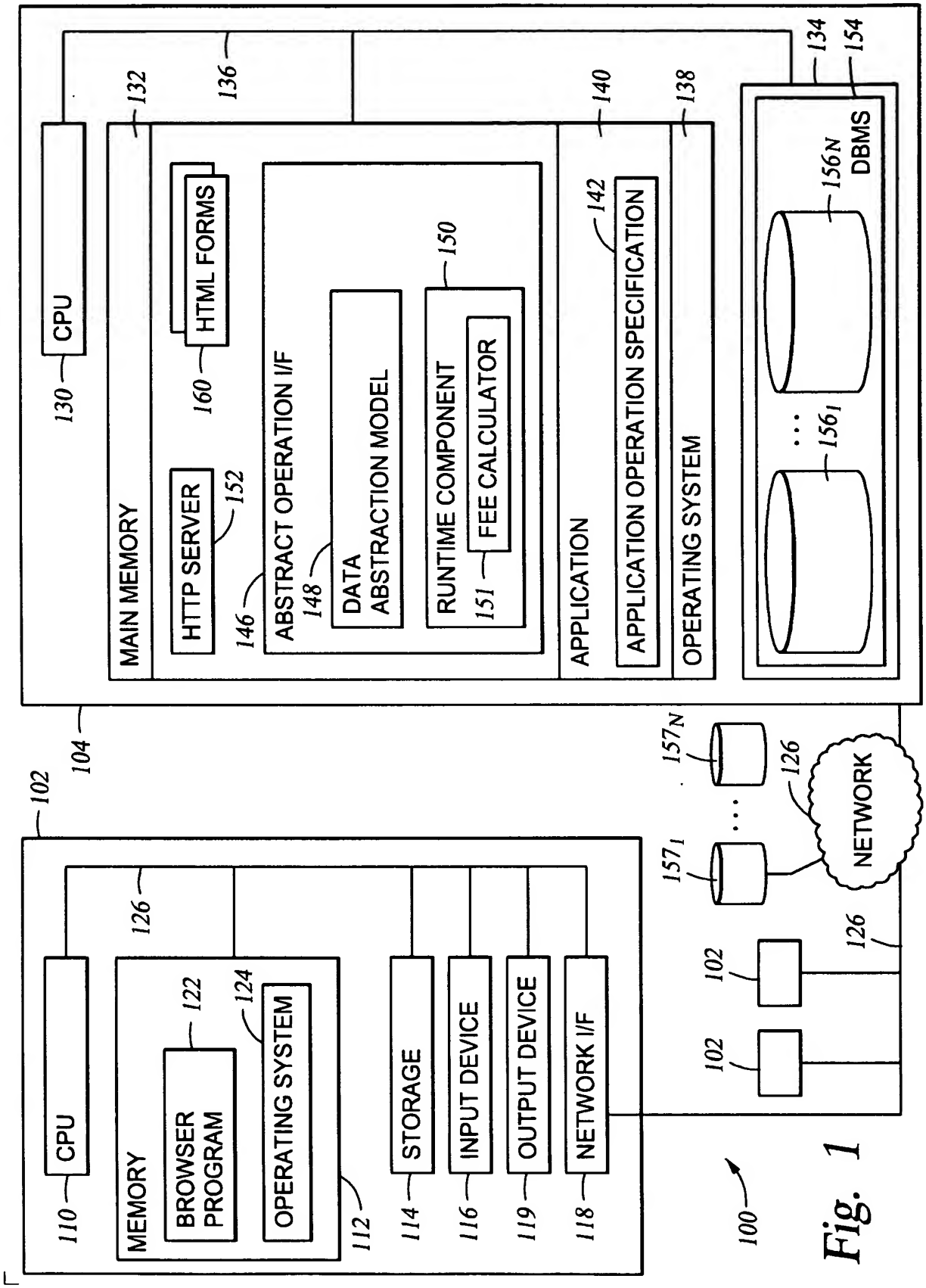

CPU
110
MEMORY
BROWSER PROGRAM
122
OPERATING SYSTEM
124
112
126
STORAGE
114
INPUT DEVICE
116
OUTPUT DEVICE
119
NETWORK I/F
118
102
100
102
126
NETWORK
126
157_1
157_N
104
CPU
130
MAIN MEMORY
132
136
HTML FORMS
160
HTTP SERVER
152
ABSTRACT OPERATION I/F
146
DATA ABSTRACTION MODEL
148
RUNTIME COMPONENT
150
FEE CALCULATOR
151
APPLICATION
140
APPLICATION OPERATION SPECIFICATION
142
OPERATING SYSTEM
138
134
154
DBMS
156_N
156_1

Fig. 1

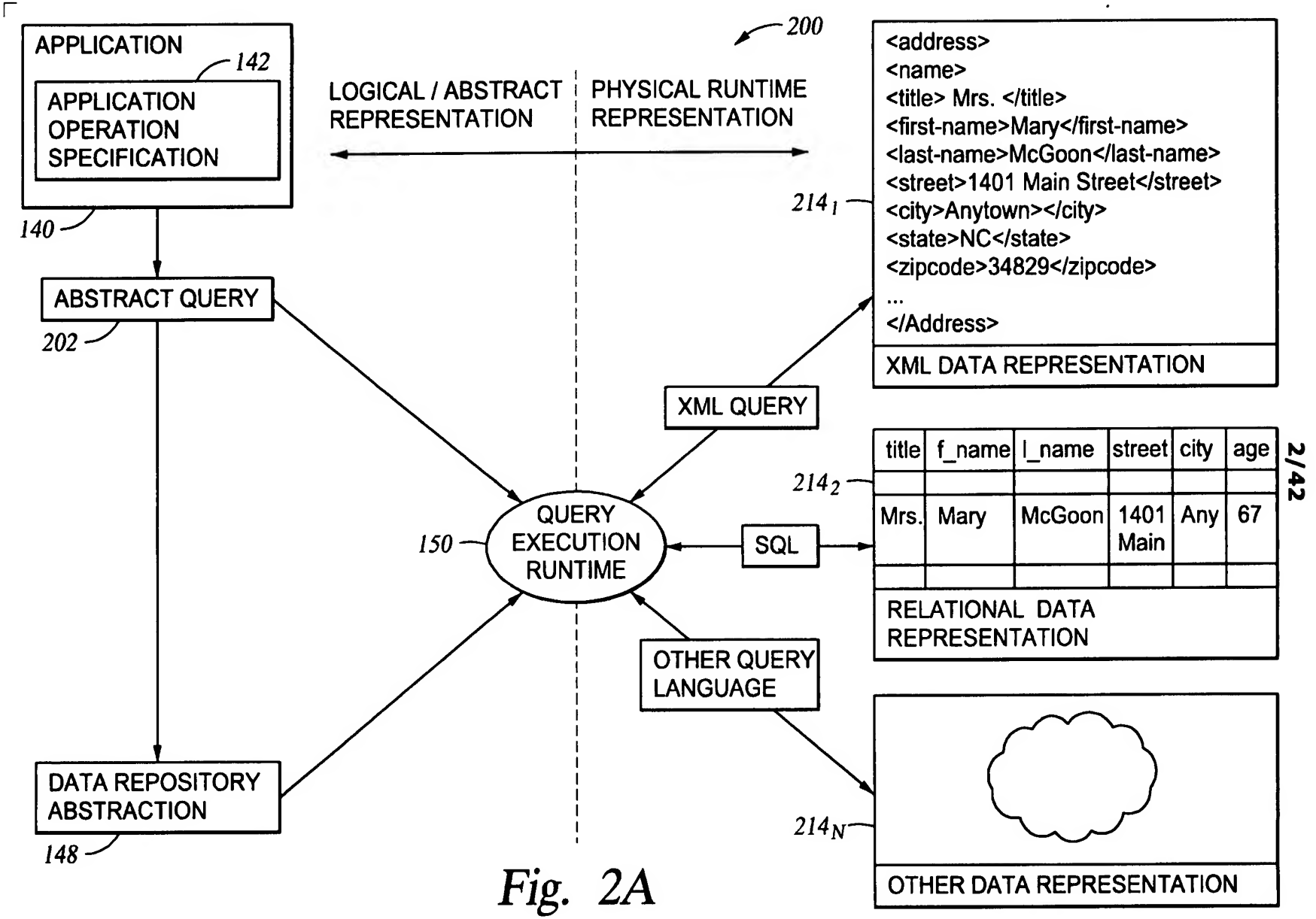

APPLICATION
142
APPLICATION OPERATION SPECIFICATION
140
ABSTRACT QUERY
202
DATA REPOSITORY ABSTRACTION
148
200
LOGICAL / ABSTRACT REPRESENTATION
PHYSICAL RUNTIME REPRESENTATION
QUERY EXECUTION RUNTIME
150
XML QUERY
SQL
OTHER QUERY LANGUAGE
214 1
<address>
<name>
<title> Mrs. </title>
<first-name>Mary</first-name>
<last-name>McGoon</last-name>
<street>1401 Main Street</street>
<city>Anytown></city>
<state>NC</state>
<zipcode>34829</zipcode>
...
</Address>
XML DATA REPRESENTATION
214 2
title
f_name
l_name
street
city
age
Mrs.
Mary
McGoon
1401 Main
Any
67
RELATIONAL DATA REPRESENTATION
214 N
OTHER DATA REPRESENTATION

Fig. 2A

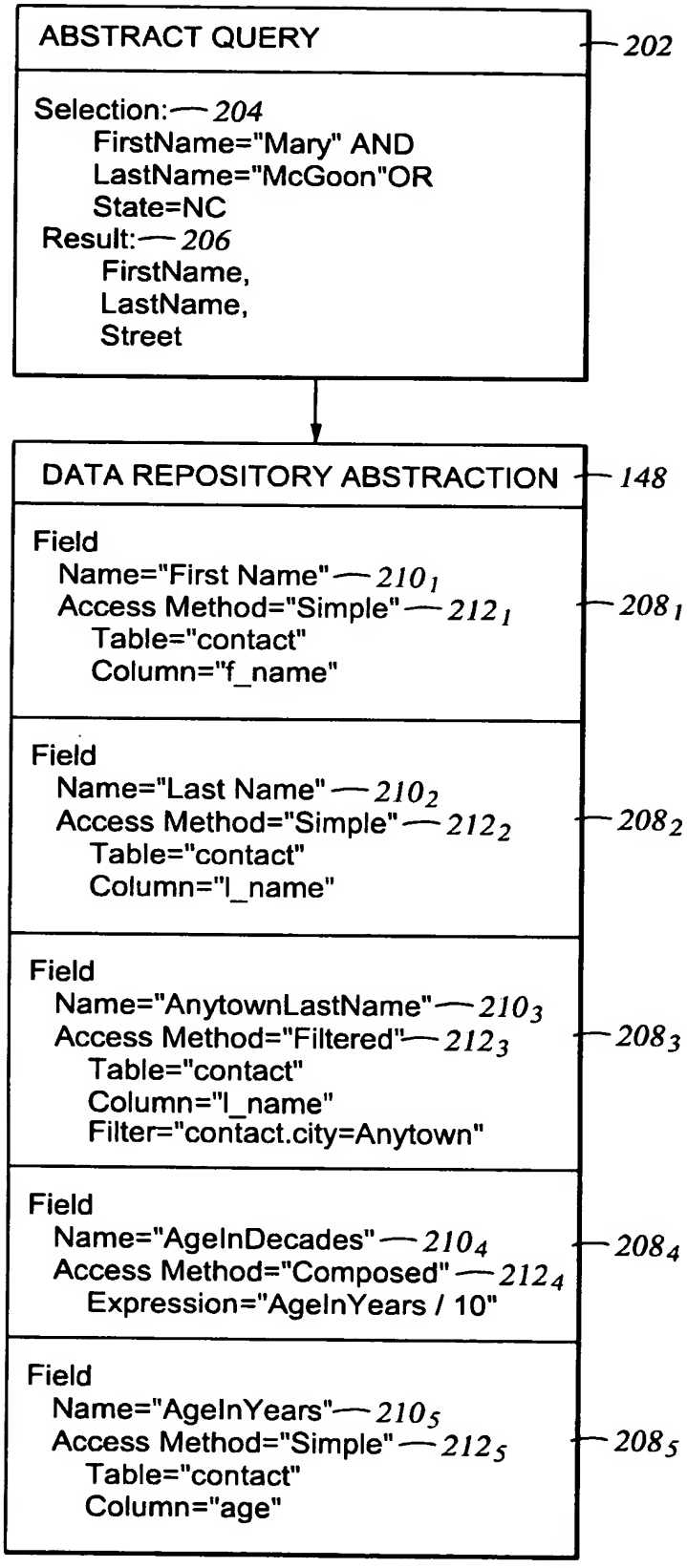

ABSTRACT QUERY
202
Selection: 204
FirstName="Mary" AND
LastName="McGoon"OR
State=NC
Result: 206
FirstName,
LastName,
Street
DATA REPOSITORY ABSTRACTION
148
Field
Name="First Name" 210 1
Access Method="Simple" 212 1
Table="contact"
Column="f_name"
208 1
Field
Name="Last Name" 210 2
Access Method="Simple" 212 2
Table="contact"
Column="l_name"
208 2
Field
Name="AnytownLastName" 210 3
Access Method="Filtered" 212 3
Table="contact"
Column="l_name"
Filter="contact.city=Anytown"
208 3
Field
Name="AgeInDecades" 210 4
Access Method="Composed" 212 4
Expression="AgeInYears / 10"
208 4
Field
Name="AgeInYears" 210 5
Access Method="Simple" 212 5
Table="contact"
Column="age"
208 5

Fig. 2B

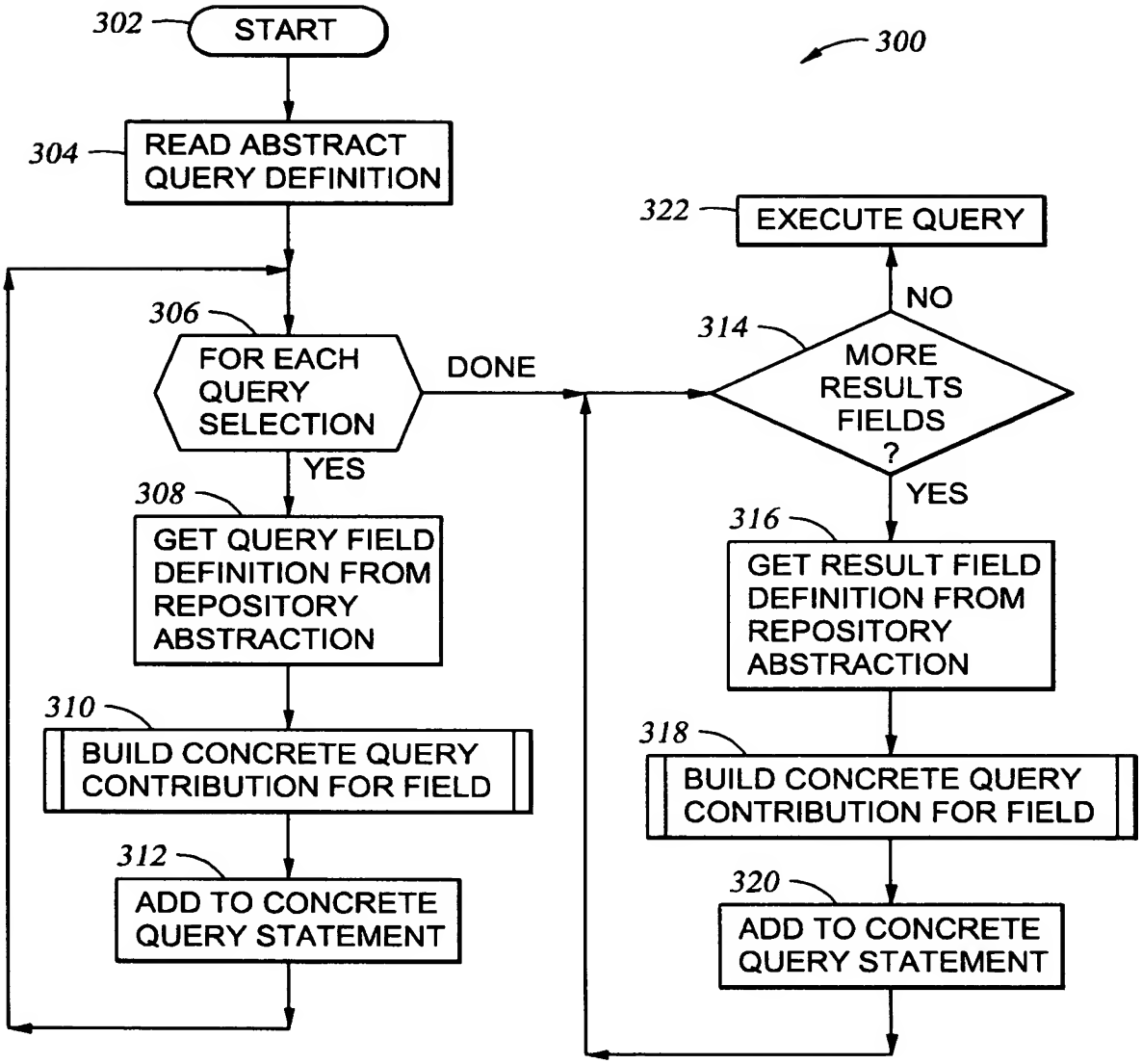

302
START
300
304
READ ABSTRACT QUERY DEFINITION
322
EXECUTE QUERY
NO
306
FOR EACH QUERY SELECTION
DONE
314
MORE RESULTS FIELDS ?
YES
308
GET QUERY FIELD DEFINITION FROM REPOSITORY ABSTRACTION
316
GET RESULT FIELD DEFINITION FROM REPOSITORY ABSTRACTION
310
BUILD CONCRETE QUERY CONTRIBUTION FOR FIELD
318
BUILD CONCRETE QUERY CONTRIBUTION FOR FIELD
312
ADD TO CONCRETE QUERY STATEMENT
320
ADD TO CONCRETE QUERY STATEMENT

Fig. 3

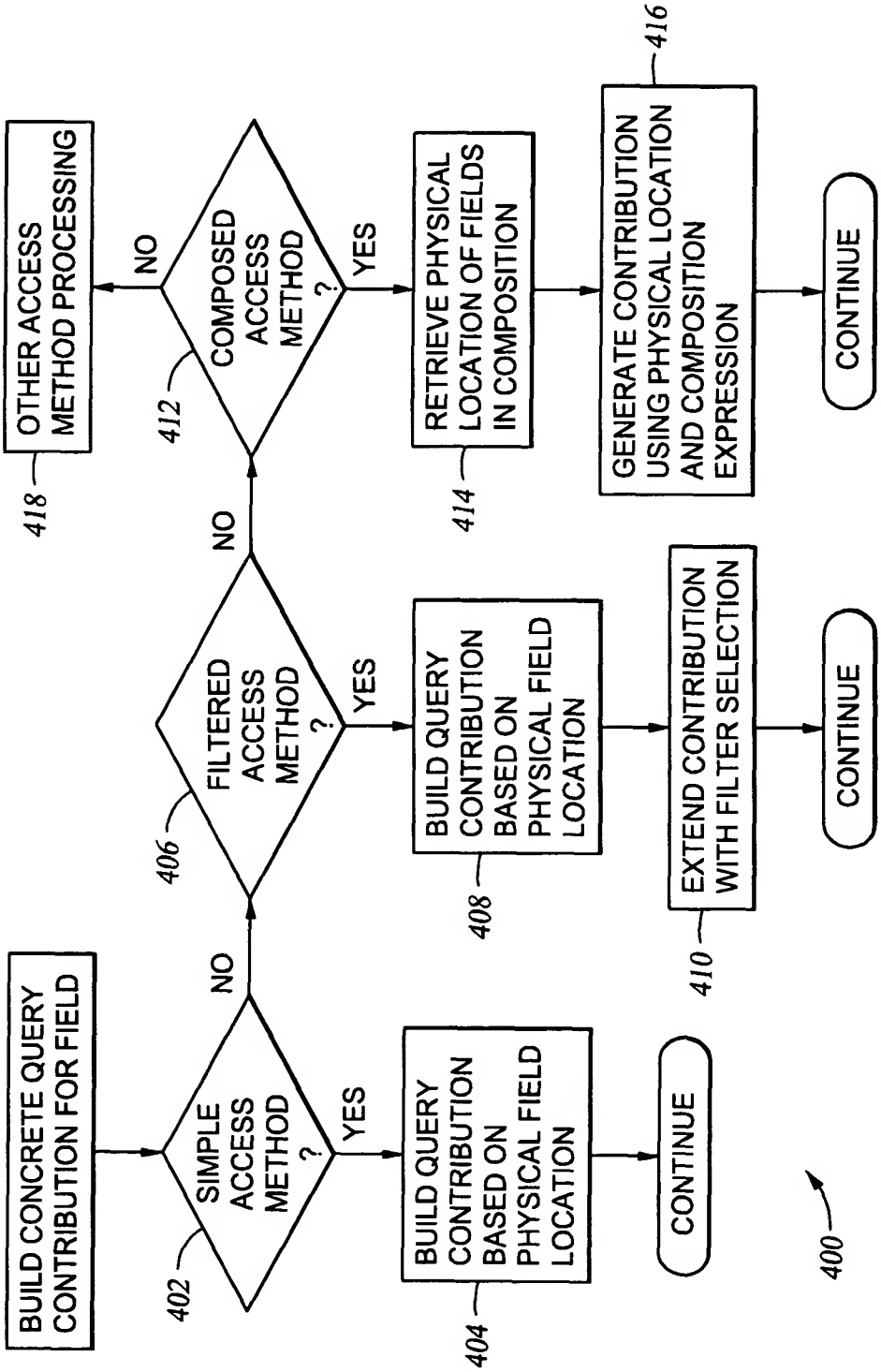

BUILD CONCRETE QUERY CONTRIBUTION FOR FIELD
SIMPLE ACCESS METHOD ?
402
YES
NO
BUILD QUERY CONTRIBUTION BASED ON PHYSICAL FIELD LOCATION
404
CONTINUE
FILTERED ACCESS METHOD ?
406
YES
NO
BUILD QUERY CONTRIBUTION BASED ON PHYSICAL FIELD LOCATION
408
EXTEND CONTRIBUTION WITH FILTER SELECTION
410
CONTINUE
COMPOSED ACCESS METHOD ?
412
YES
NO
RETRIEVE PHYSICAL LOCATION OF FIELDS IN COMPOSITION
414
GENERATE CONTRIBUTION USING PHYSICAL LOCATION AND COMPOSITION EXPRESSION
416
CONTINUE
OTHER ACCESS METHOD PROCESSING
418
400

Fig. 4

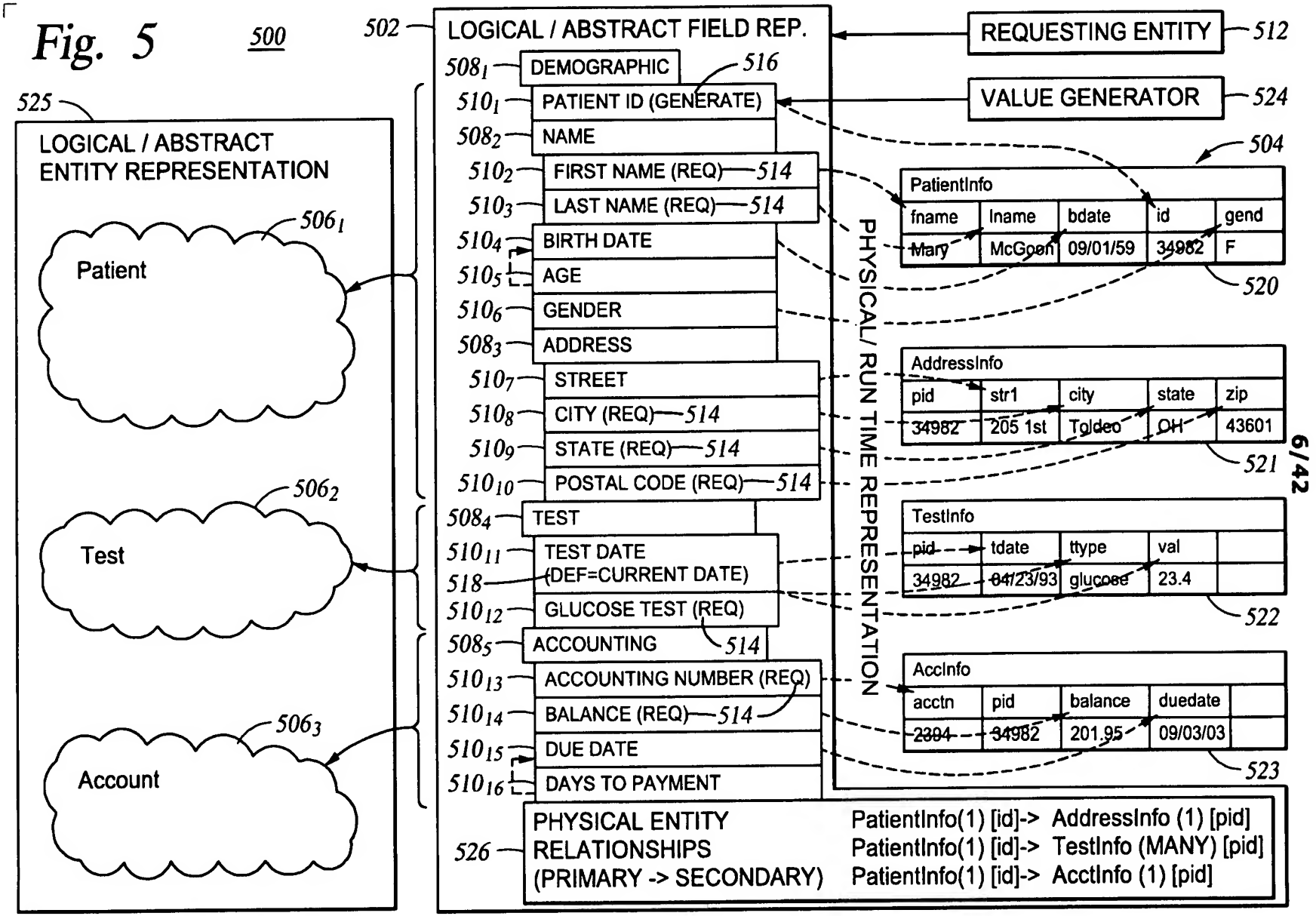


Fig. 5
500
502
LOGICAL / ABSTRACT FIELD REP.
REQUESTING ENTITY
512
VALUE GENERATOR
524
504
525
LOGICAL / ABSTRACT ENTITY REPRESENTATION
Patient
Test
Account
506_1
506_2
506_3
508_1 DEMOGRAPHIC
516
510_1 PATIENT ID (GENERATE)
508_2 NAME
510_2 FIRST NAME (REQ) 514
510_3 LAST NAME (REQ) 514
510_4 BIRTH DATE
510_5 AGE
510_6 GENDER
508_3 ADDRESS
510_7 STREET
510_8 CITY (REQ) 514
510_9 STATE (REQ) 514
510_{10} POSTAL CODE (REQ) 514
508_4 TEST
510_{11} TEST DATE
518 (DEF=CURRENT DATE)
510_{12} GLUCOSE TEST (REQ)
514
508_5 ACCOUNTING
510_{13} ACCOUNTING NUMBER (REQ)
510_{14} BALANCE (REQ) 514
510_{15} DUE DATE
510_{16} DAYS TO PAYMENT
PHYSICAL/ RUN TIME REPRESENTATION
PatientInfo
fname | lname | bdate | id | gend
Mary | McGoon | 09/01/59 | 34982 | F
520
AddressInfo
pid | str1 | city | state | zip
34982 | 205 1st | Toledo | OH | 43601
521
TestInfo
pid | tdate | ttype | val
34982 | 04/23/93 | glucose | 23.4
522
AccInfo
acctn | pid | balance | duedate
2394 | 34982 | 201.95 | 09/03/03
523
526
PHYSICAL ENTITY RELATIONSHIPS (PRIMARY -> SECONDARY)
PatientInfo(1) [id]-> AddressInfo (1) [pid]
PatientInfo(1) [id]-> TestInfo (MANY) [pid]
PatientInfo(1) [id]-> AcctInfo (1) [pid]

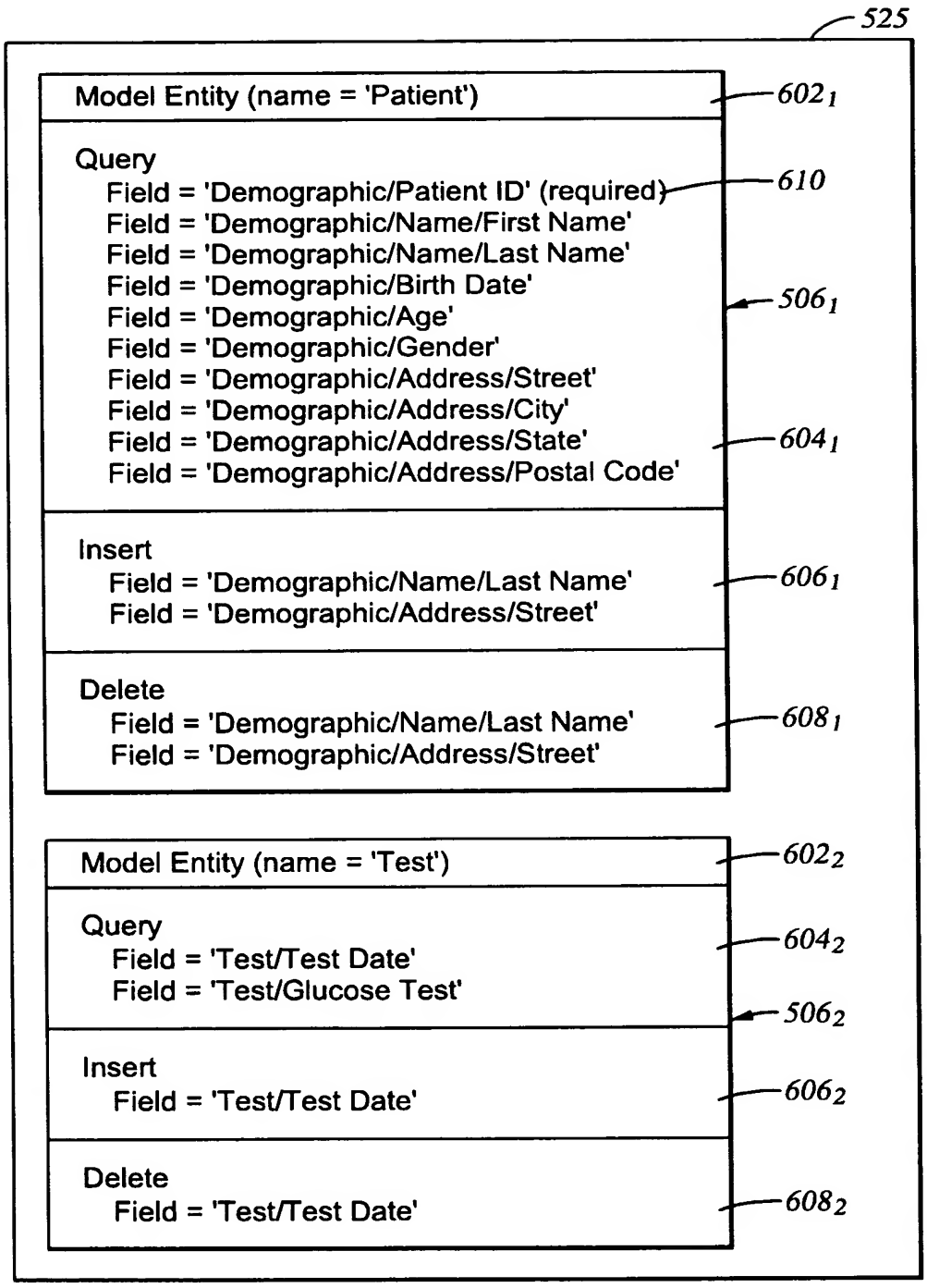

525
Model Entity (name = 'Patient')
602 1
Query
Field = 'Demographic/Patient ID' (required)
610
Field = 'Demographic/Name/First Name'
Field = 'Demographic/Name/Last Name'
Field = 'Demographic/Birth Date'
Field = 'Demographic/Age'
506 1
Field = 'Demographic/Gender'
Field = 'Demographic/Address/Street'
Field = 'Demographic/Address/City'
Field = 'Demographic/Address/State'
604 1
Field = 'Demographic/Address/Postal Code'
Insert
Field = 'Demographic/Name/Last Name'
606 1
Field = 'Demographic/Address/Street'
Delete
Field = 'Demographic/Name/Last Name'
608 1
Field = 'Demographic/Address/Street'
Model Entity (name = 'Test')
602 2
Query
Field = 'Test/Test Date'
604 2
Field = 'Test/Glucose Test'
506 2
Insert
Field = 'Test/Test Date'
606 2
Delete
Field = 'Test/Test Date'
608 2

Fig. 6

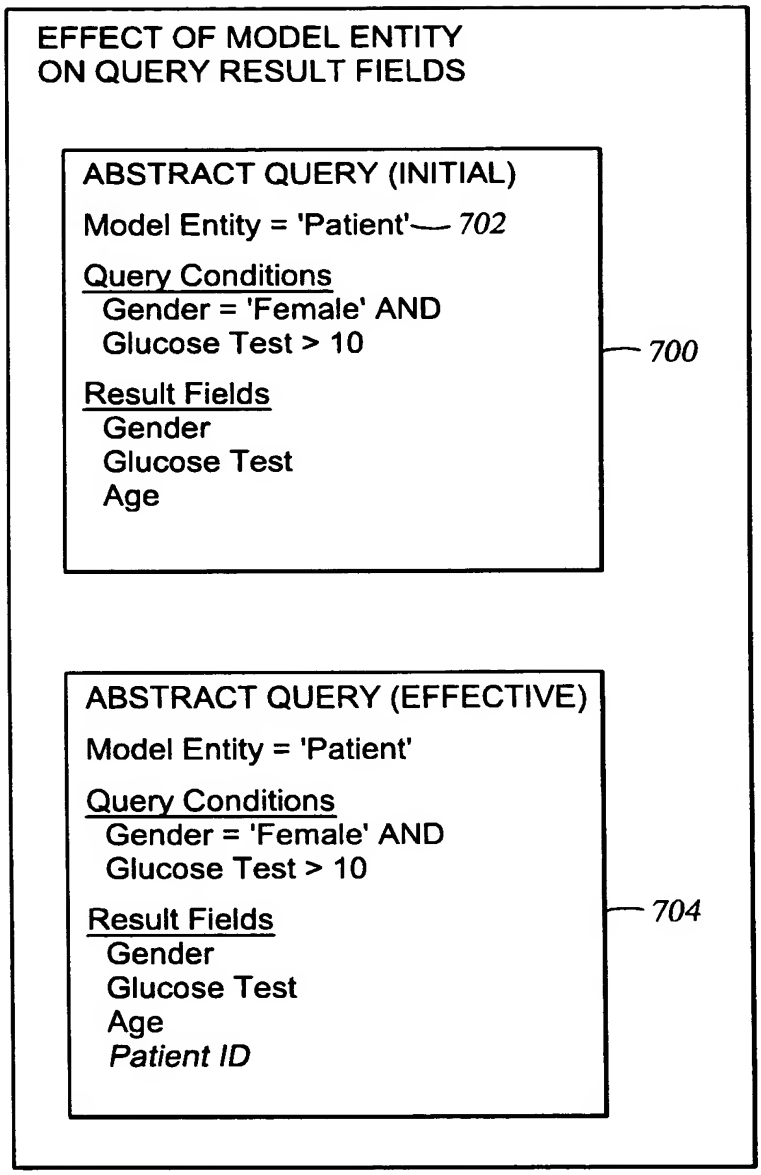

EFFECT OF MODEL ENTITY
ON QUERY RESULT FIELDS
ABSTRACT QUERY (INITIAL)
Model Entity = 'Patient'
702
Query Conditions
Gender = 'Female' AND
Glucose Test > 10
Result Fields
Gender
Glucose Test
Age
700
ABSTRACT QUERY (EFFECTIVE)
Model Entity = 'Patient'
Query Conditions
Gender = 'Female' AND
Glucose Test > 10
Result Fields
Gender
Glucose Test
Age
Patient ID
704

Fig. 7

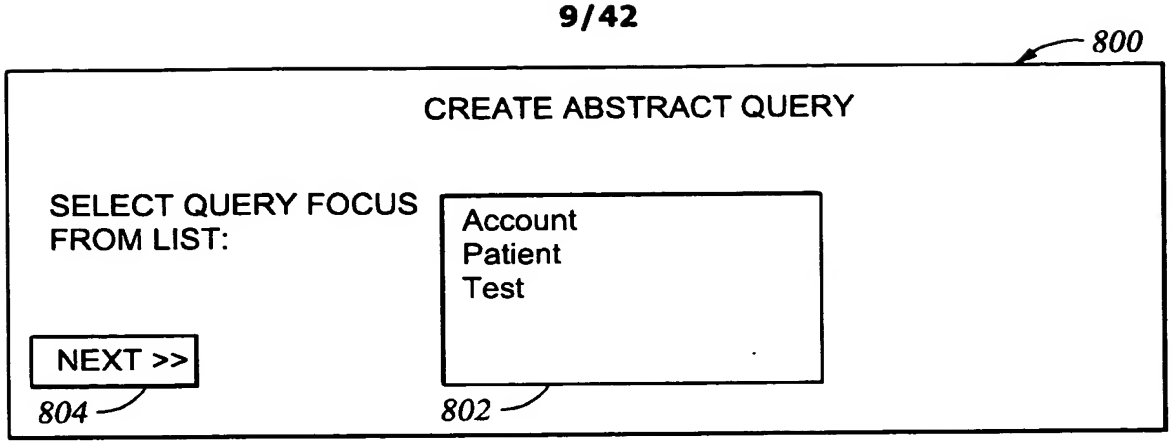


Fig. 8

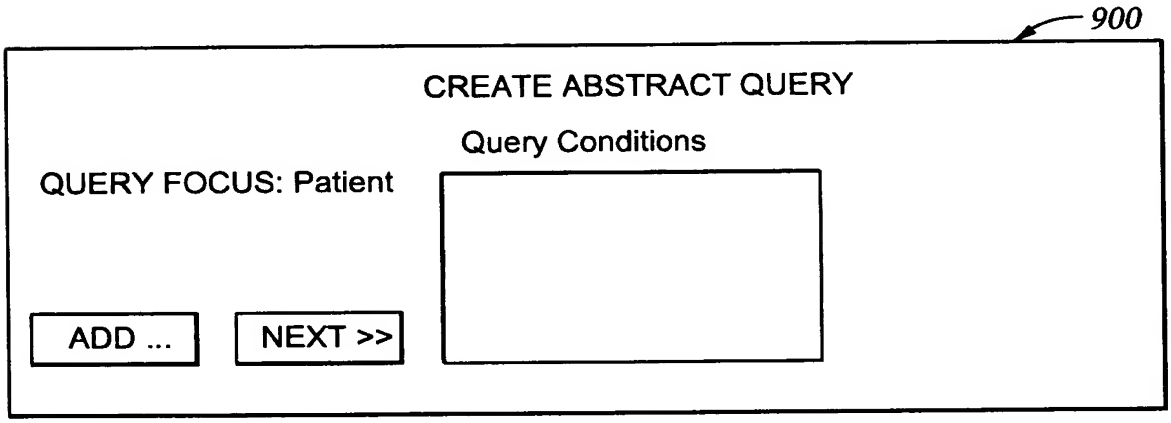


Fig. 9

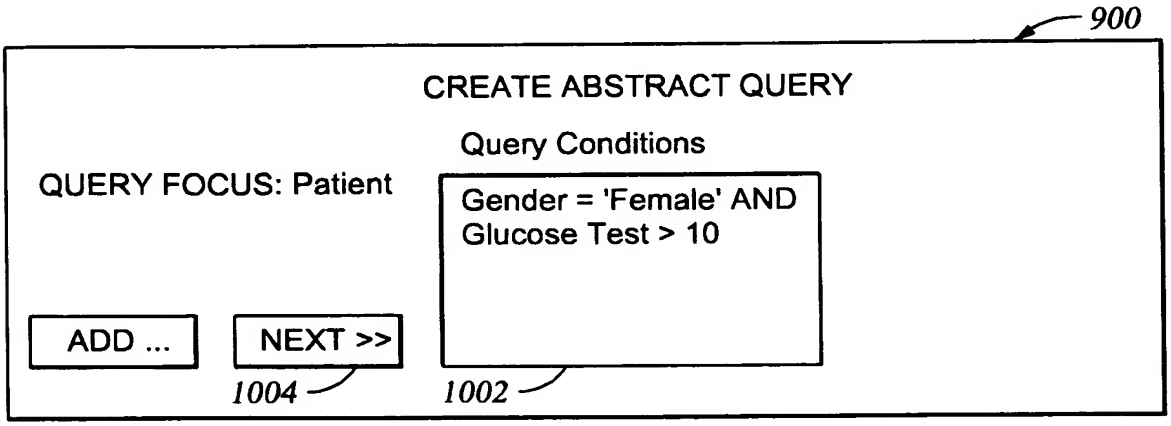


Fig. 10

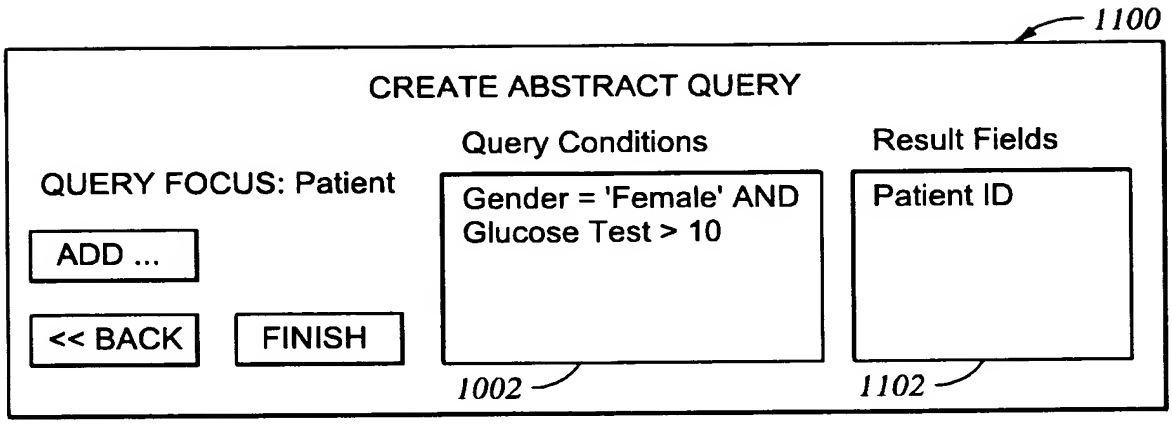

1100
CREATE ABSTRACT QUERY
Query Conditions
Result Fields
QUERY FOCUS: Patient
Gender = 'Female' AND
Glucose Test > 10
Patient ID
ADD ...
<< BACK
FINISH
1002
1102

Fig. 11

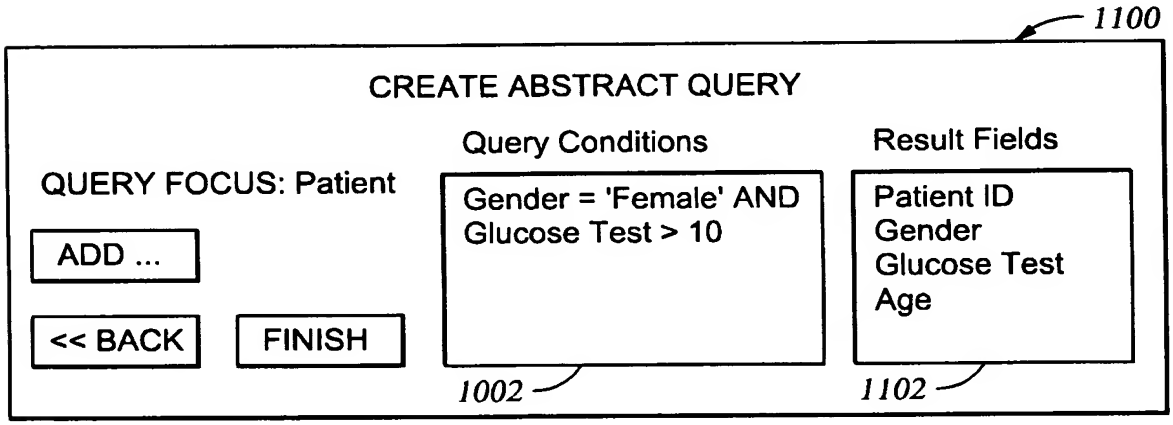

1100
CREATE ABSTRACT QUERY
Query Conditions
Result Fields
QUERY FOCUS: Patient
Gender = 'Female' AND
Glucose Test > 10
Patient ID
Gender
Glucose Test
Age
ADD ...
<< BACK
FINISH
1002
1102

Fig. 12

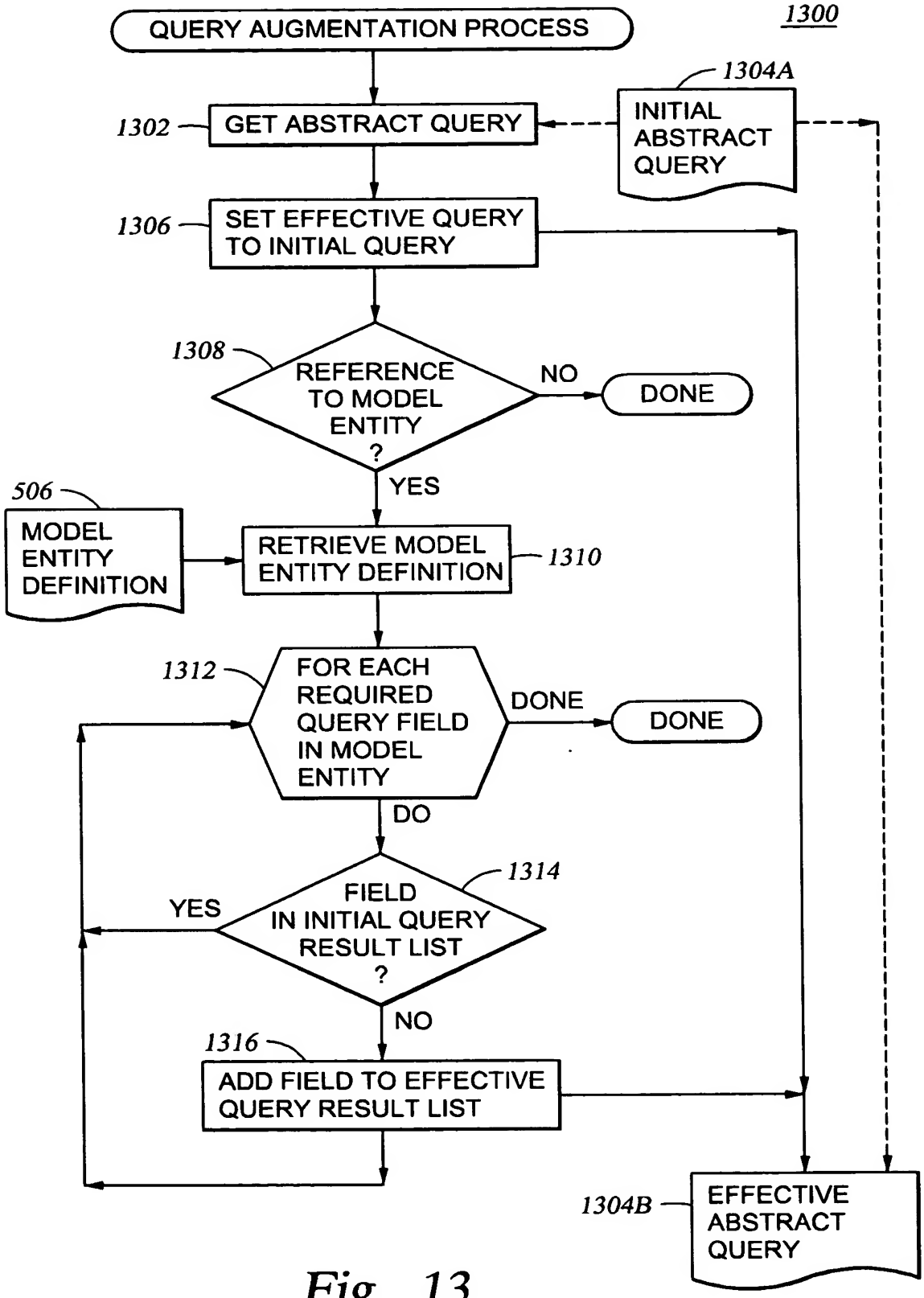

QUERY AUGMENTATION PROCESS
1300
1304A
INITIAL ABSTRACT QUERY
1302
GET ABSTRACT QUERY
1306
SET EFFECTIVE QUERY TO INITIAL QUERY
1308
REFERENCE TO MODEL ENTITY ?
NO
DONE
YES
506
MODEL ENTITY DEFINITION
RETRIEVE MODEL ENTITY DEFINITION
1310
1312
FOR EACH REQUIRED QUERY FIELD IN MODEL ENTITY
DONE
DONE
DO
1314
FIELD IN INITIAL QUERY RESULT LIST ?
YES
NO
1316
ADD FIELD TO EFFECTIVE QUERY RESULT LIST
1304B
EFFECTIVE ABSTRACT QUERY

Fig. 13

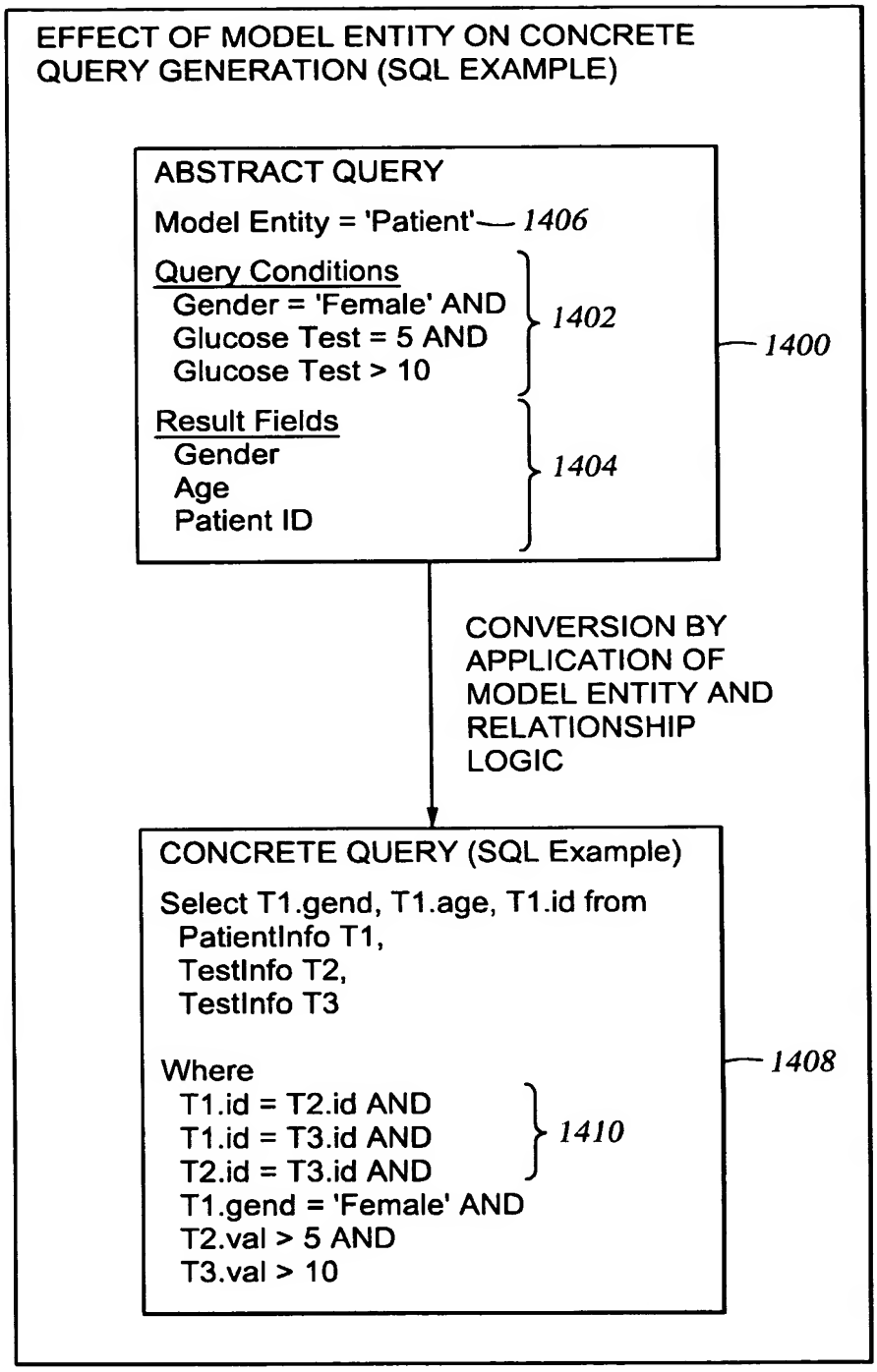

EFFECT OF MODEL ENTITY ON CONCRETE QUERY GENERATION (SQL EXAMPLE)
ABSTRACT QUERY
Model Entity = 'Patient'
1406
Query Conditions
Gender = 'Female' AND
Glucose Test = 5 AND
Glucose Test > 10
1402
Result Fields
Gender
Age
Patient ID
1404
1400
CONVERSION BY APPLICATION OF MODEL ENTITY AND RELATIONSHIP LOGIC
CONCRETE QUERY (SQL Example)
Select T1.gend, T1.age, T1.id from
PatientInfo T1,
TestInfo T2,
TestInfo T3
Where
T1.id = T2.id AND
T1.id = T3.id AND
T2.id = T3.id AND
1410
T1.gend = 'Female' AND
T2.val > 5 AND
T3.val > 10
1408

Fig. 14

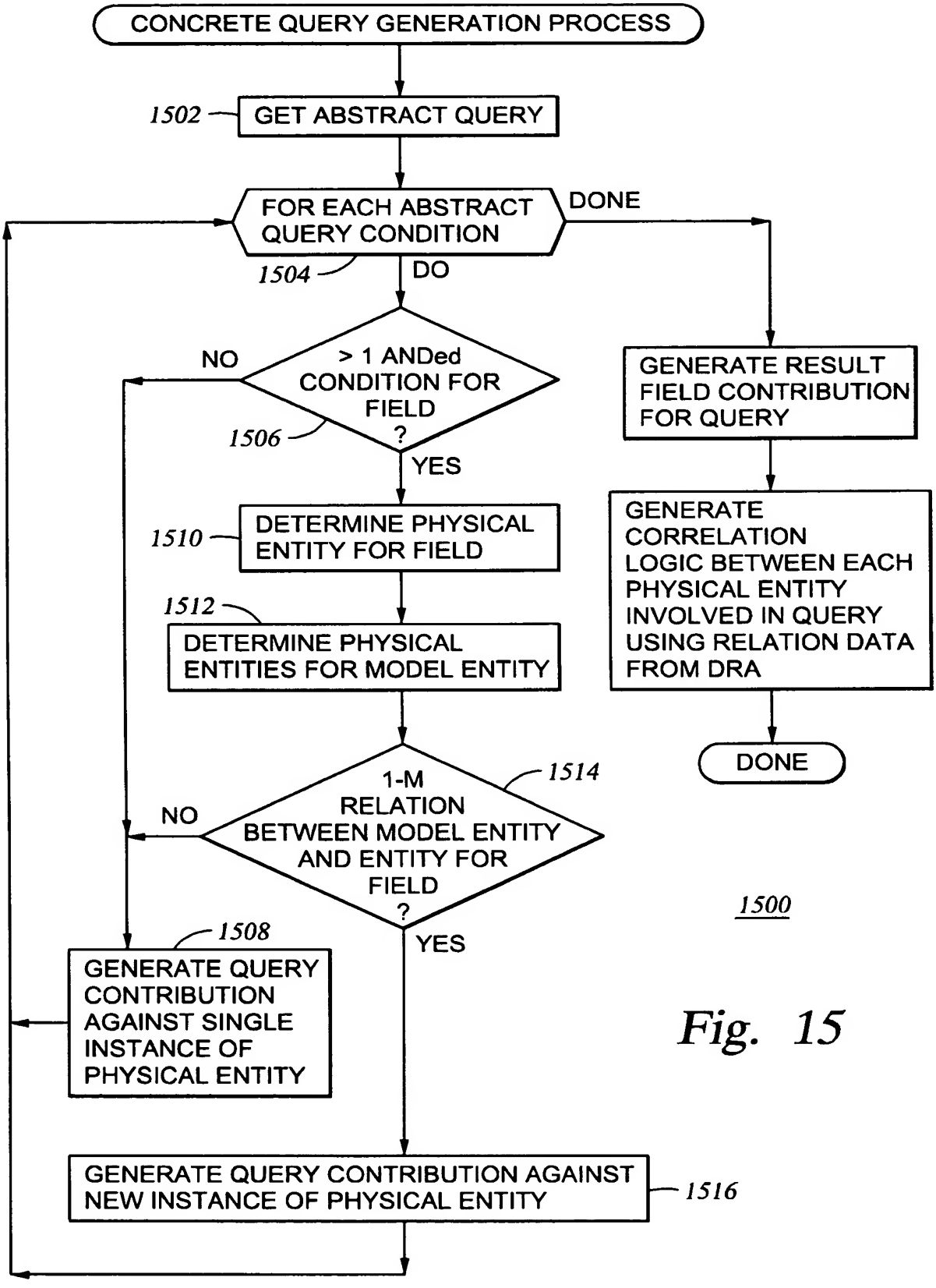

CONCRETE QUERY GENERATION PROCESS
1502
GET ABSTRACT QUERY
FOR EACH ABSTRACT QUERY CONDITION
DONE
1504
DO
NO
> 1 ANDed CONDITION FOR FIELD ?
1506
YES
GENERATE RESULT FIELD CONTRIBUTION FOR QUERY
1510
DETERMINE PHYSICAL ENTITY FOR FIELD
1512
DETERMINE PHYSICAL ENTITIES FOR MODEL ENTITY
GENERATE CORRELATION LOGIC BETWEEN EACH PHYSICAL ENTITY INVOLVED IN QUERY USING RELATION DATA FROM DRA
DONE
1514
1-M RELATION BETWEEN MODEL ENTITY AND ENTITY FOR FIELD ?
NO
YES
1500
1508
GENERATE QUERY CONTRIBUTION AGAINST SINGLE INSTANCE OF PHYSICAL ENTITY
GENERATE QUERY CONTRIBUTION AGAINST NEW INSTANCE OF PHYSICAL ENTITY
1516

Fig. 15

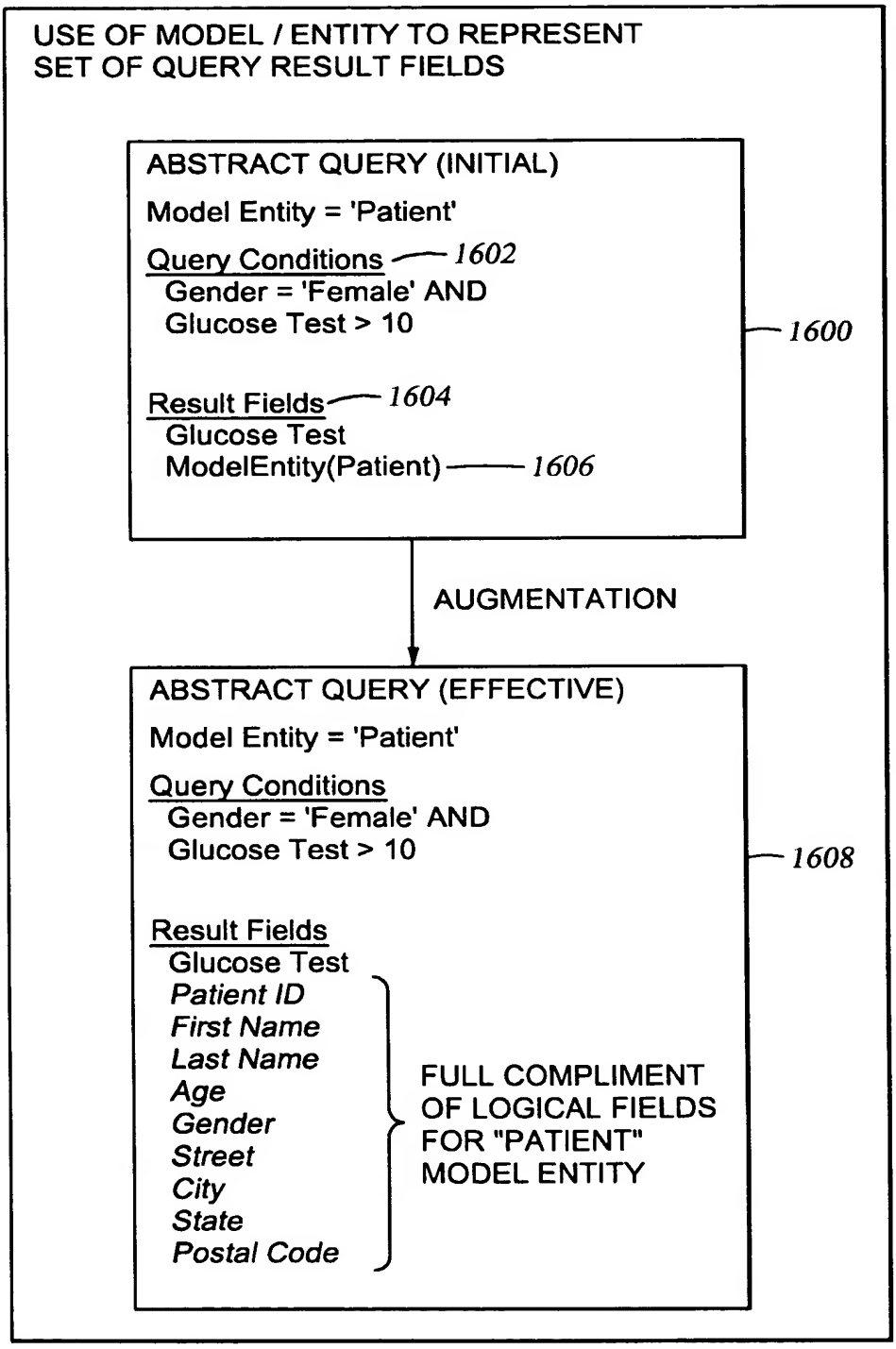

USE OF MODEL / ENTITY TO REPRESENT SET OF QUERY RESULT FIELDS
ABSTRACT QUERY (INITIAL)
Model Entity = 'Patient'
Query Conditions
1602
Gender = 'Female' AND
Glucose Test > 10
1600
Result Fields
1604
Glucose Test
ModelEntity(Patient)
1606
AUGMENTATION
ABSTRACT QUERY (EFFECTIVE)
Model Entity = 'Patient'
Query Conditions
Gender = 'Female' AND
Glucose Test > 10
1608
Result Fields
Glucose Test
Patient ID
First Name
Last Name
Age
Gender
Street
City
State
Postal Code
FULL COMPLIMENT OF LOGICAL FIELDS FOR "PATIENT" MODEL ENTITY

Fig. 16

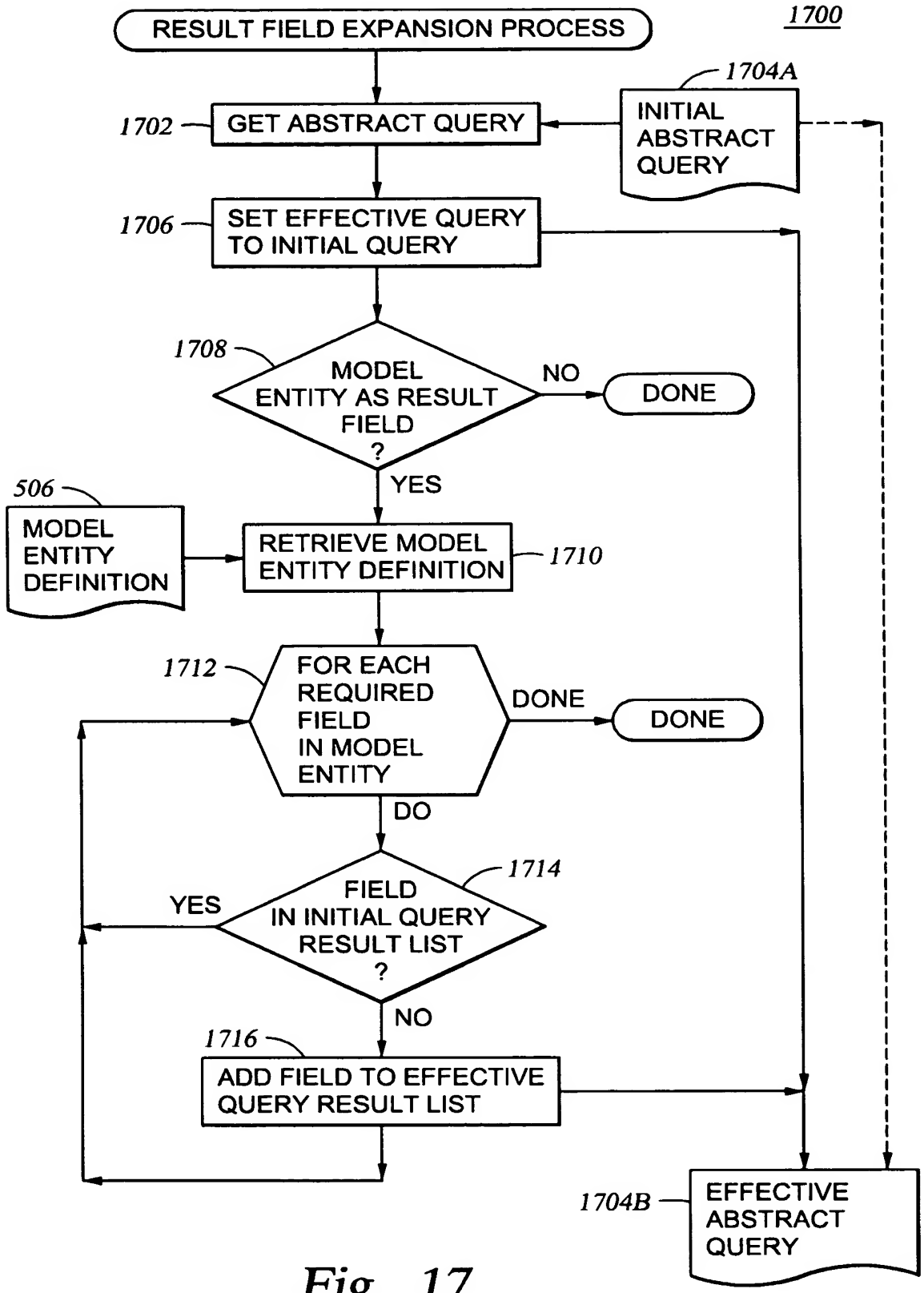

RESULT FIELD EXPANSION PROCESS
1700
1704A
INITIAL ABSTRACT QUERY
1702
GET ABSTRACT QUERY
1706
SET EFFECTIVE QUERY TO INITIAL QUERY
1708
MODEL ENTITY AS RESULT FIELD ?
NO
DONE
YES
506
MODEL ENTITY DEFINITION
RETRIEVE MODEL ENTITY DEFINITION
1710
1712
FOR EACH REQUIRED FIELD IN MODEL ENTITY
DONE
DONE
DO
1714
FIELD IN INITIAL QUERY RESULT LIST ?
YES
NO
1716
ADD FIELD TO EFFECTIVE QUERY RESULT LIST
1704B
EFFECTIVE ABSTRACT QUERY

Fig. 17

Fig. 18

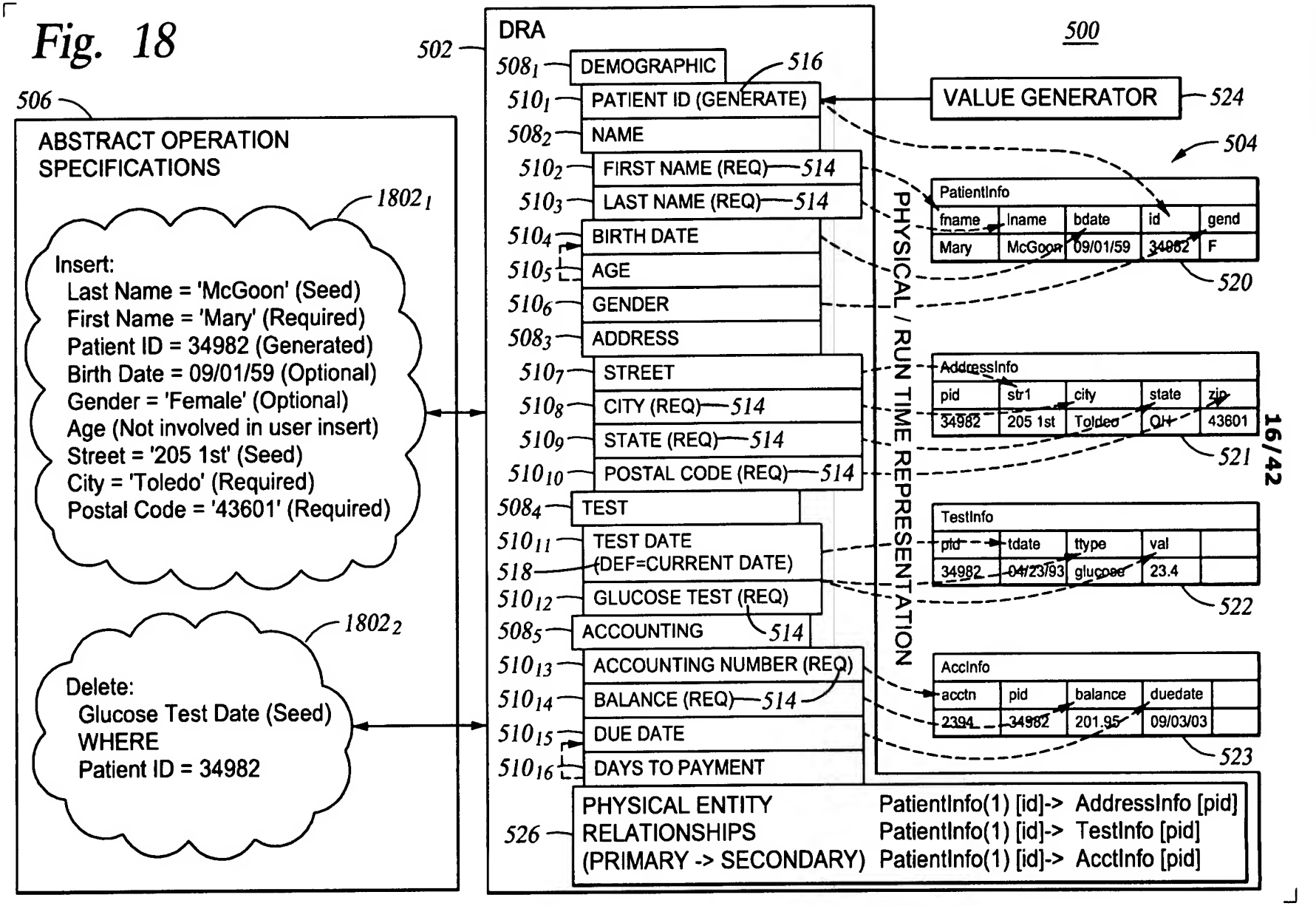
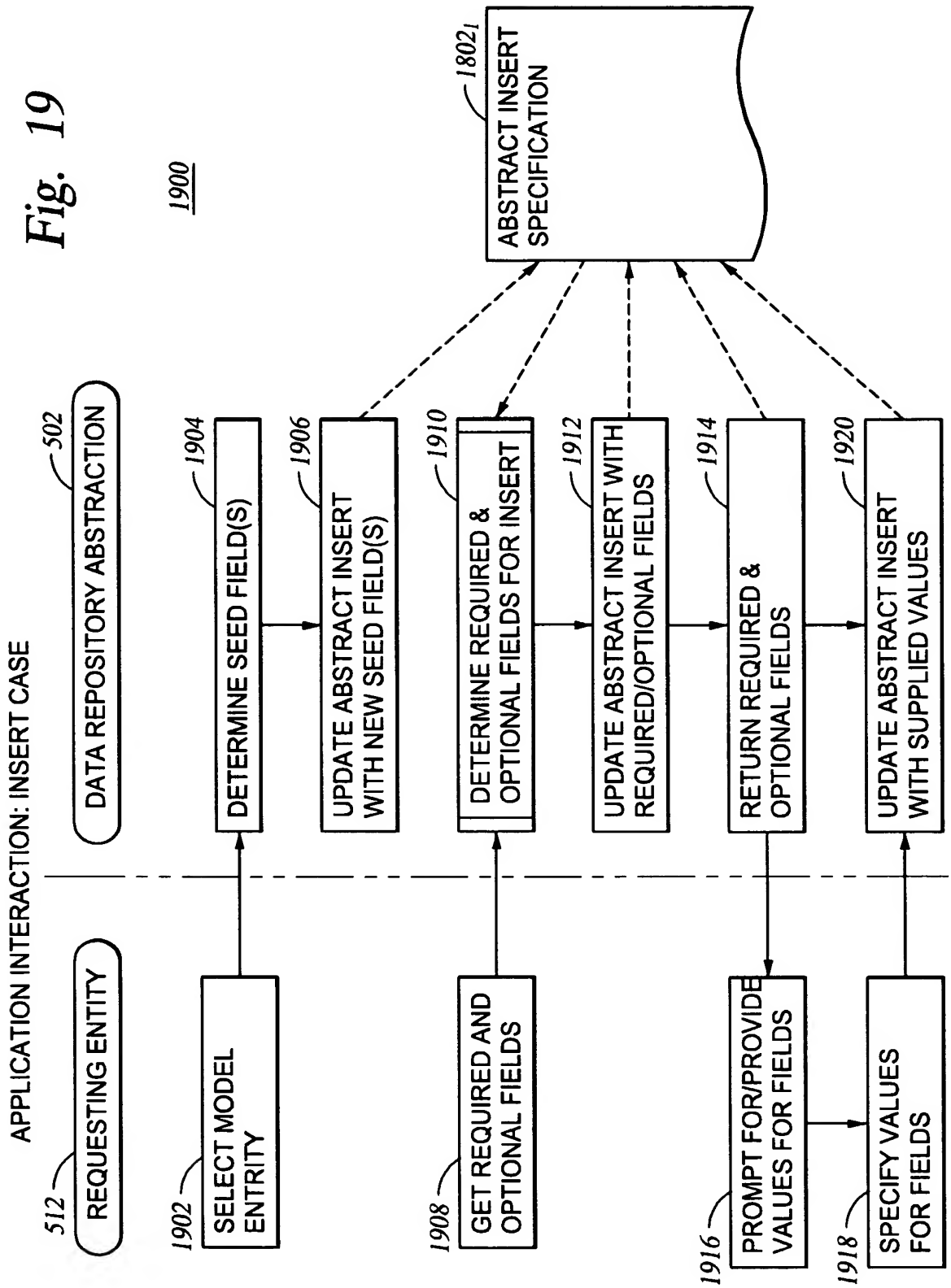

500
502
DRA
506
ABSTRACT OPERATION SPECIFICATIONS
1802 1
Insert:
Last Name = 'McGoon' (Seed)
First Name = 'Mary' (Required)
Patient ID = 34982 (Generated)
Birth Date = 09/01/59 (Optional)
Gender = 'Female' (Optional)
Age (Not involved in user insert)
Street = '205 1st' (Seed)
City = 'Toledo' (Required)
Postal Code = '43601' (Required)
1802 2
Delete:
Glucose Test Date (Seed)
WHERE
Patient ID = 34982
508 1 DEMOGRAPHIC
510 1 PATIENT ID (GENERATE)
516
508 2 NAME
510 2 FIRST NAME (REQ)
514
510 3 LAST NAME (REQ)
514
510 4 BIRTH DATE
510 5 AGE
510 6 GENDER
508 3 ADDRESS
510 7 STREET
510 8 CITY (REQ)
514
510 9 STATE (REQ)
514
510 10 POSTAL CODE (REQ)
514
508 4 TEST
510 11 TEST DATE
518 (DEF=CURRENT DATE)
510 12 GLUCOSE TEST (REQ)
508 5 ACCOUNTING
514
510 13 ACCOUNTING NUMBER (REQ)
510 14 BALANCE (REQ)
514
510 15 DUE DATE
510 16 DAYS TO PAYMENT
526
PHYSICAL ENTITY RELATIONSHIPS (PRIMARY -> SECONDARY)
PatientInfo(1) [id]-> AddressInfo [pid]
PatientInfo(1) [id]-> TestInfo [pid]
PatientInfo(1) [id]-> AcctInfo [pid]
PHYSICAL / RUN TIME REPRESENTATION
VALUE GENERATOR
524
504
PatientInfo
fname lname bdate id gend
Mary McGoon 09/01/59 34982 F
520
AddressInfo
pid str1 city state zip
34982 205 1st Toledo OH 43601
521
TestInfo
pid tdate ttype val
34982 04/23/93 glucose 23.4
522
AcctInfo
acctn pid balance duedate
2394 34982 201.95 09/03/03
523

Fig. 19


1900
APPLICATION INTERACTION: INSERT CASE
512
REQUESTING ENTITY
502
DATA REPOSITORY ABSTRACTION
1802₁
ABSTRACT INSERT SPECIFICATION
1902
SELECT MODEL ENTRITY
1904
DETERMINE SEED FIELD(S)
1906
UPDATE ABSTRACT INSERT WITH NEW SEED FIELD(S)
1908
GET REQUIRED AND OPTIONAL FIELDS
1910
DETERMINE REQUIRED & OPTIONAL FIELDS FOR INSERT
1912
UPDATE ABSTRACT INSERT WITH REQUIRED/OPTIONAL FIELDS
1914
RETURN REQUIRED & OPTIONAL FIELDS
1916
PROMPT FOR/PROVIDE VALUES FOR FIELDS
1918
SPECIFY VALUES FOR FIELDS
1920
UPDATE ABSTRACT INSERT WITH SUPPLIED VALUES

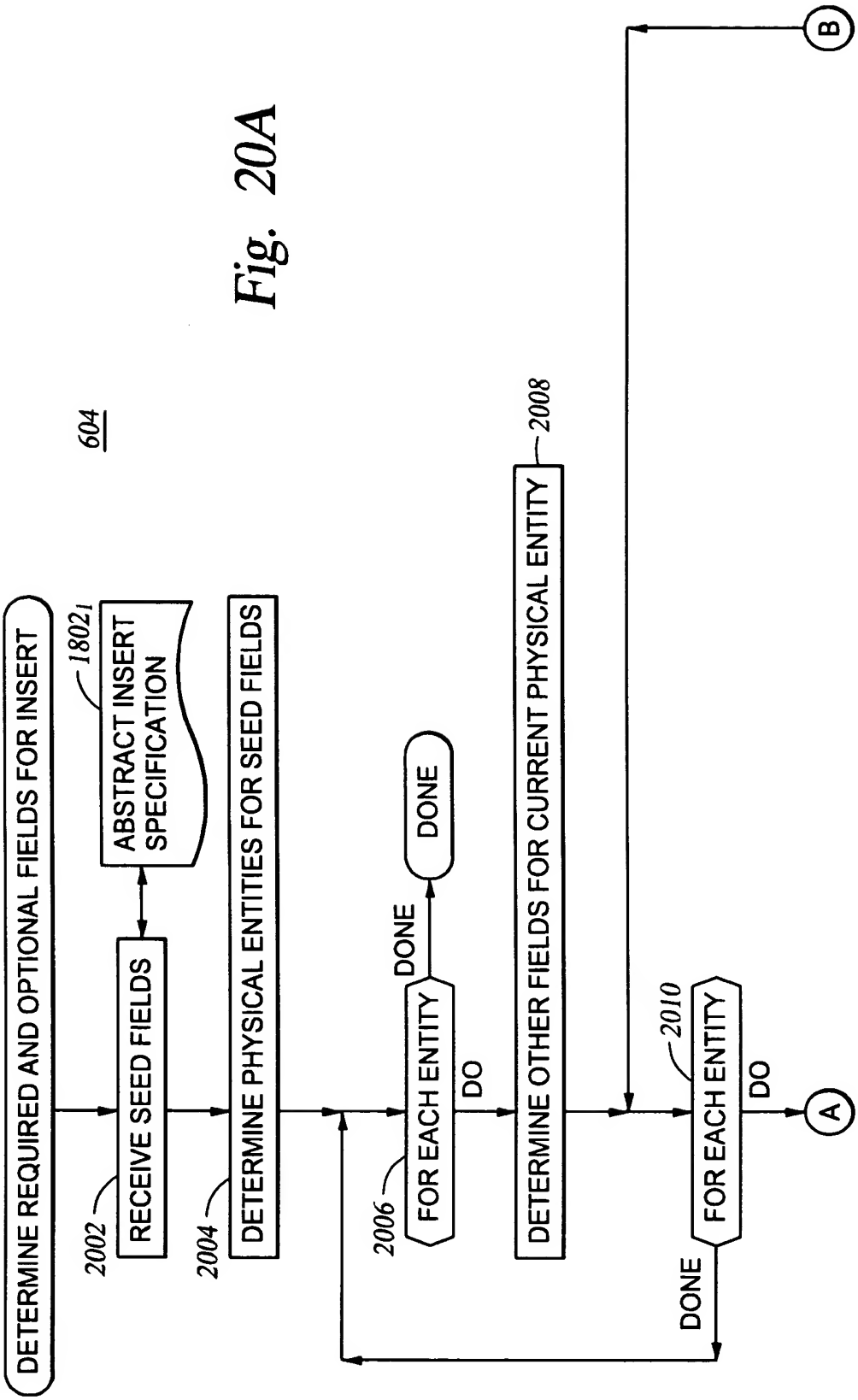

APPLICATION INTERACTION: INSERT CASE
604
DETERMINE REQUIRED AND OPTIONAL FIELDS FOR INSERT
2002
RECEIVE SEED FIELDS
1802₁
ABSTRACT INSERT SPECIFICATION
2004
DETERMINE PHYSICAL ENTITIES FOR SEED FIELDS
2006
FOR EACH ENTITY
DO
DONE
DONE
2008
DETERMINE OTHER FIELDS FOR CURRENT PHYSICAL ENTITY
2010
FOR EACH ENTITY
DO
DONE
A
B

Fig. 20A

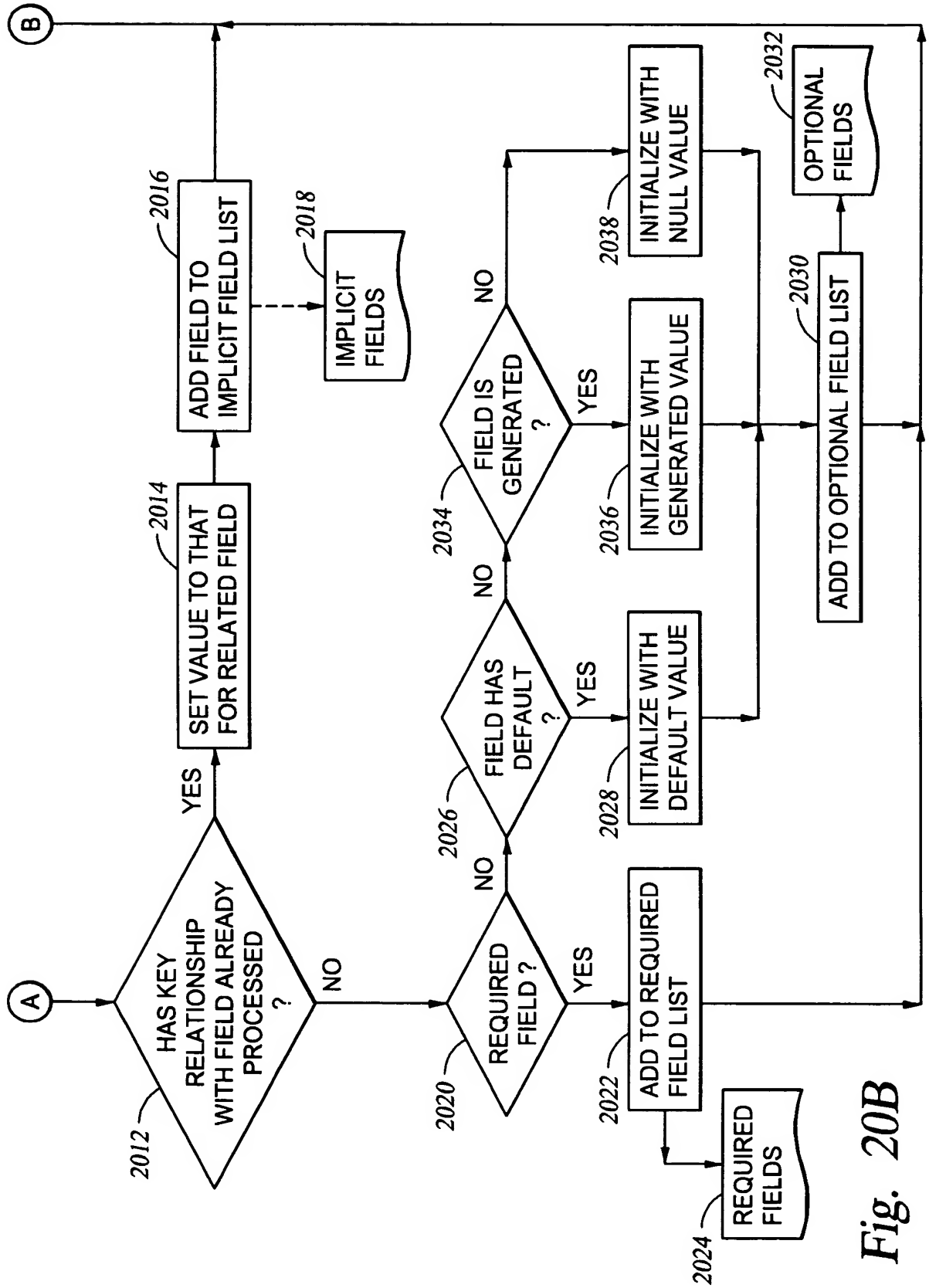

A
B
HAS KEY RELATIONSHIP WITH FIELD ALREADY PROCESSED ?
2012
YES
NO
SET VALUE TO THAT FOR RELATED FIELD
2014
ADD FIELD TO IMPLICIT FIELD LIST
2016
IMPLICIT FIELDS
2018
REQUIRED FIELD ?
2020
YES
NO
ADD TO REQUIRED FIELD LIST
2022
REQUIRED FIELDS
2024
FIELD HAS DEFAULT ?
2026
YES
NO
INITIALIZE WITH DEFAULT VALUE
2028
FIELD IS GENERATED ?
2034
YES
NO
INITIALIZE WITH GENERATED VALUE
2036
INITIALIZE WITH NULL VALUE
2038
ADD TO OPTIONAL FIELD LIST
2030
OPTIONAL FIELDS
2032

Fig. 20B

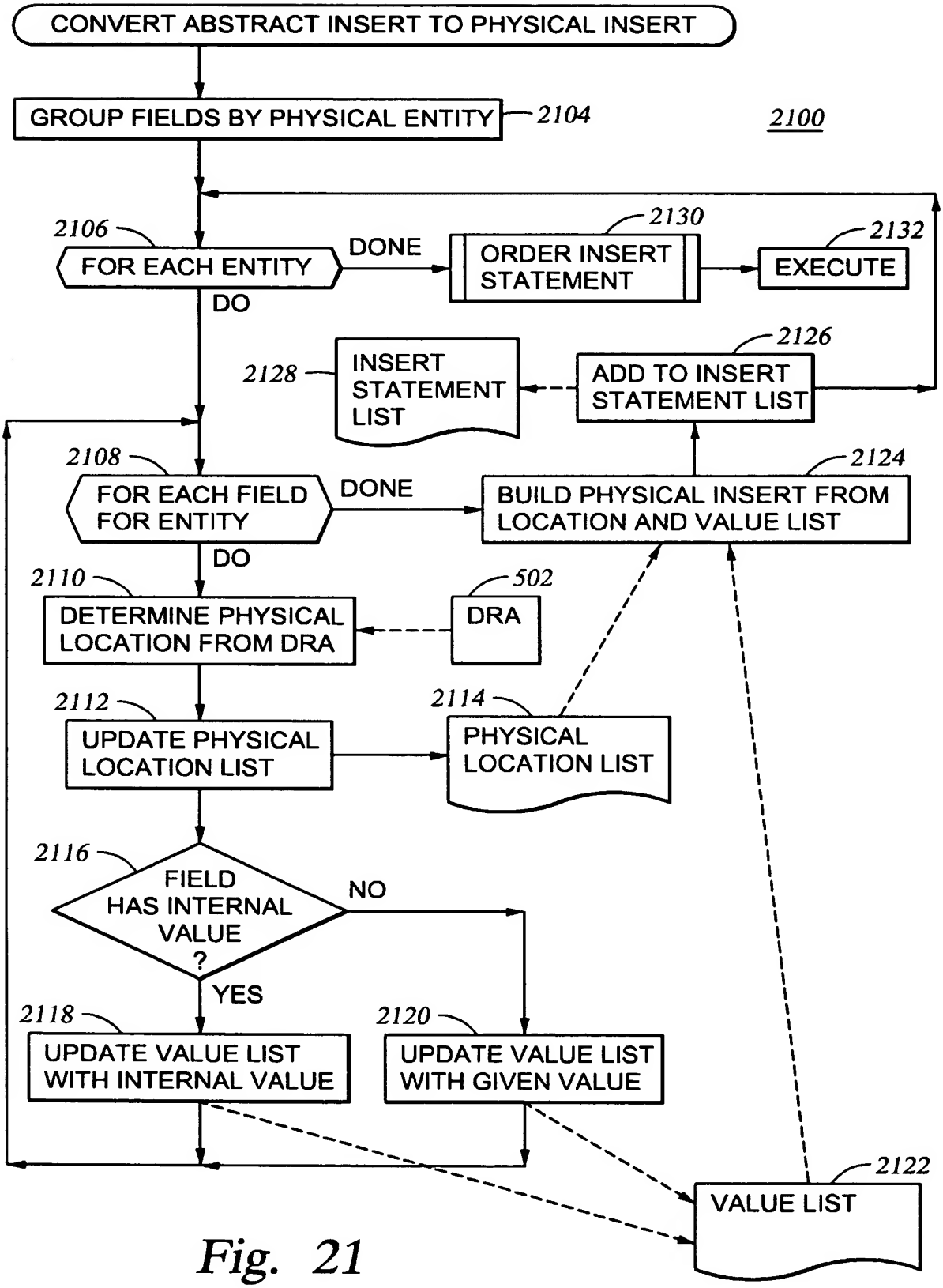
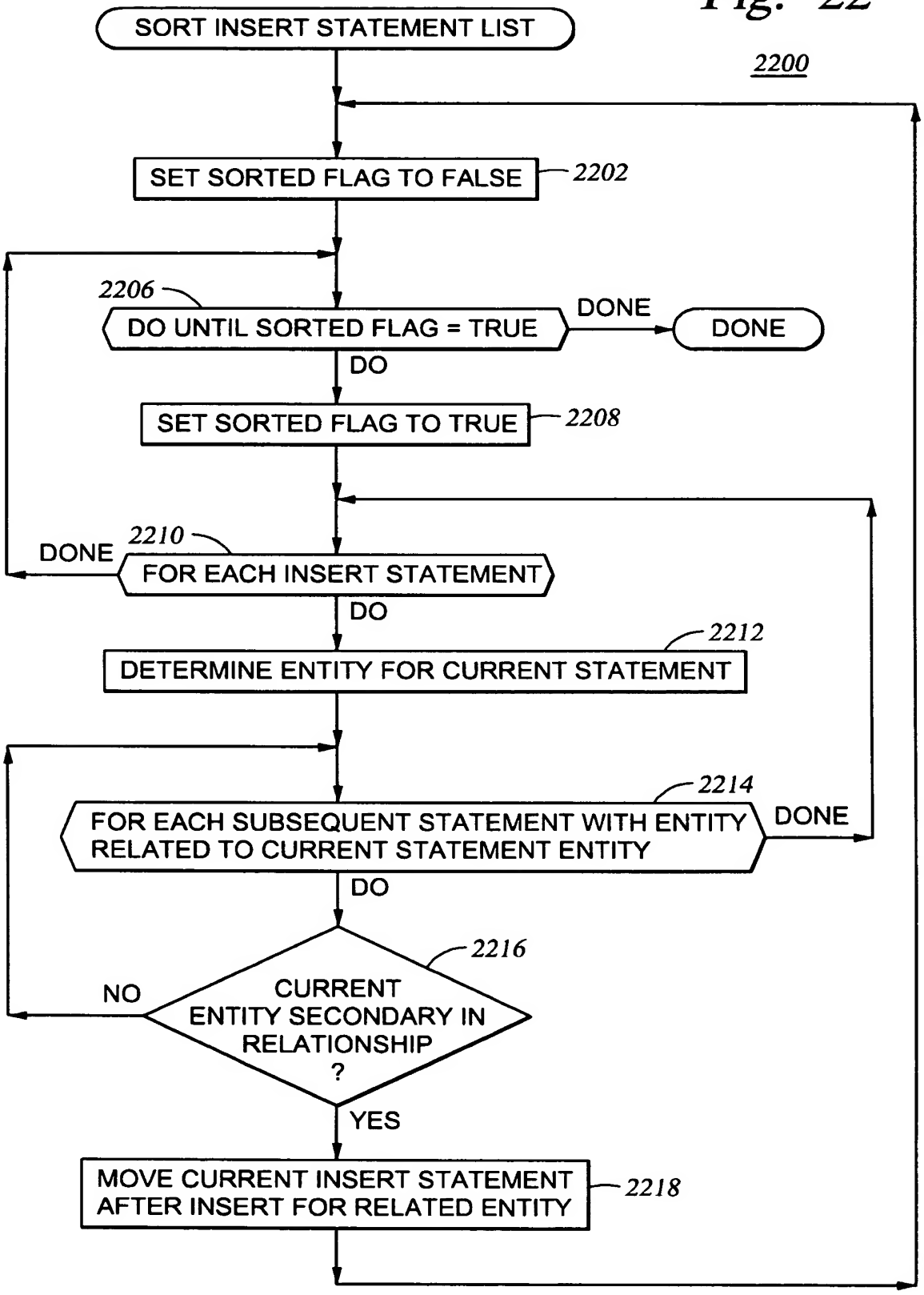

CONVERT ABSTRACT INSERT TO PHYSICAL INSERT
GROUP FIELDS BY PHYSICAL ENTITY
2104
2100
2106
FOR EACH ENTITY
DONE
2130
ORDER INSERT STATEMENT
2132
EXECUTE
DO
2126
2128
INSERT STATEMENT LIST
ADD TO INSERT STATEMENT LIST
2108
FOR EACH FIELD FOR ENTITY
DONE
2124
BUILD PHYSICAL INSERT FROM LOCATION AND VALUE LIST
DO
2110
DETERMINE PHYSICAL LOCATION FROM DRA
502
DRA
2112
UPDATE PHYSICAL LOCATION LIST
2114
PHYSICAL LOCATION LIST
2116
FIELD HAS INTERNAL VALUE ?
NO
YES
2118
UPDATE VALUE LIST WITH INTERNAL VALUE
2120
UPDATE VALUE LIST WITH GIVEN VALUE
2122
VALUE LIST

Fig. 21

Fig. 22


SORT INSERT STATEMENT LIST
2200
SET SORTED FLAG TO FALSE
2202
2206
DO UNTIL SORTED FLAG = TRUE
DONE
DONE
DO
SET SORTED FLAG TO TRUE
2208
2210
DONE
FOR EACH INSERT STATEMENT
DO
2212
DETERMINE ENTITY FOR CURRENT STATEMENT
2214
FOR EACH SUBSEQUENT STATEMENT WITH ENTITY RELATED TO CURRENT STATEMENT ENTITY
DONE
DO
2216
NO
CURRENT ENTITY SECONDARY IN RELATIONSHIP ?
YES
MOVE CURRENT INSERT STATEMENT AFTER INSERT FOR RELATED ENTITY
2218

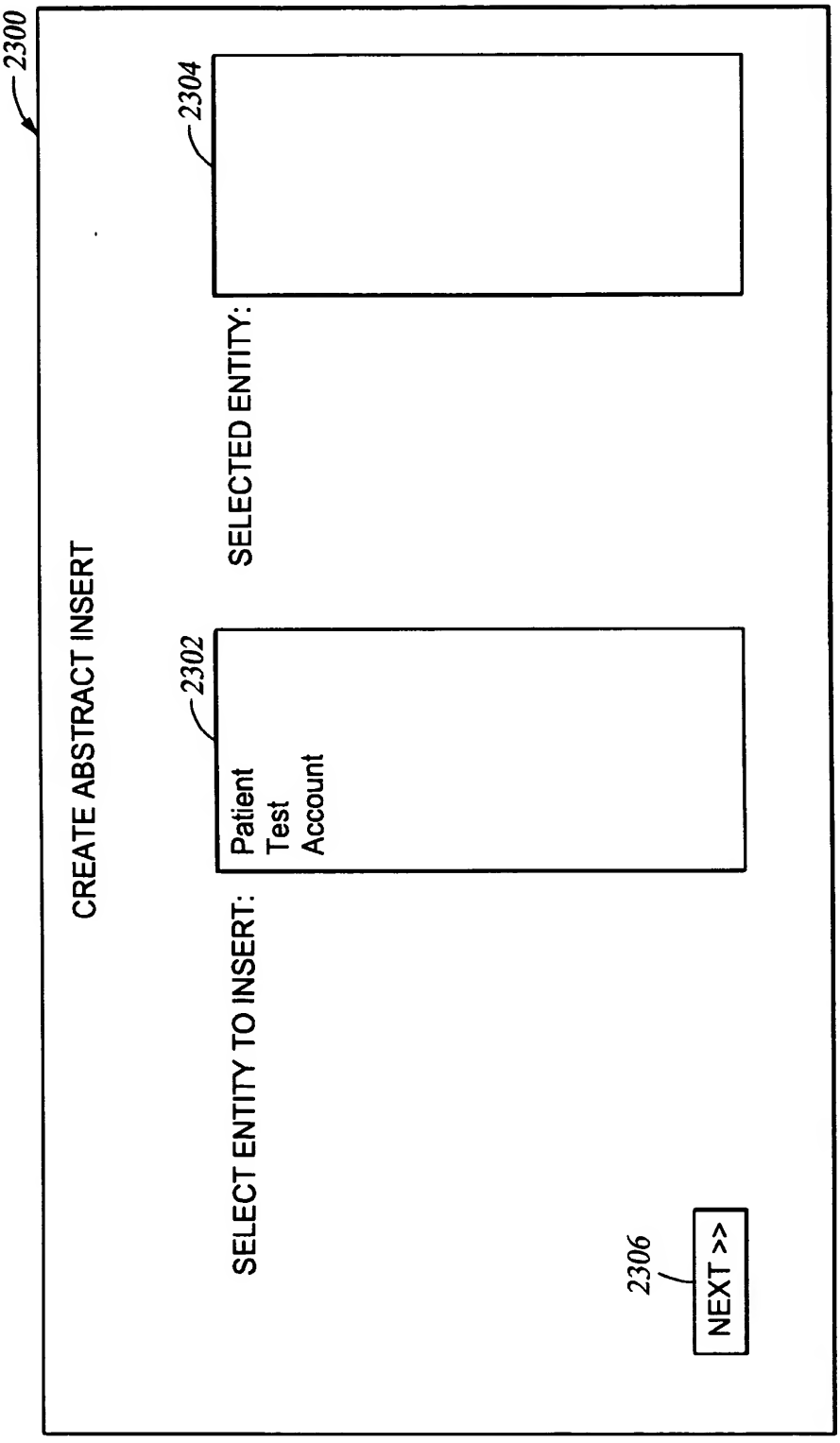

2300
CREATE ABSTRACT INSERT
SELECT ENTITY TO INSERT:
2302
Patient
Test
Account
SELECTED ENTITY:
2304
2306
NEXT >>

Fig. 23

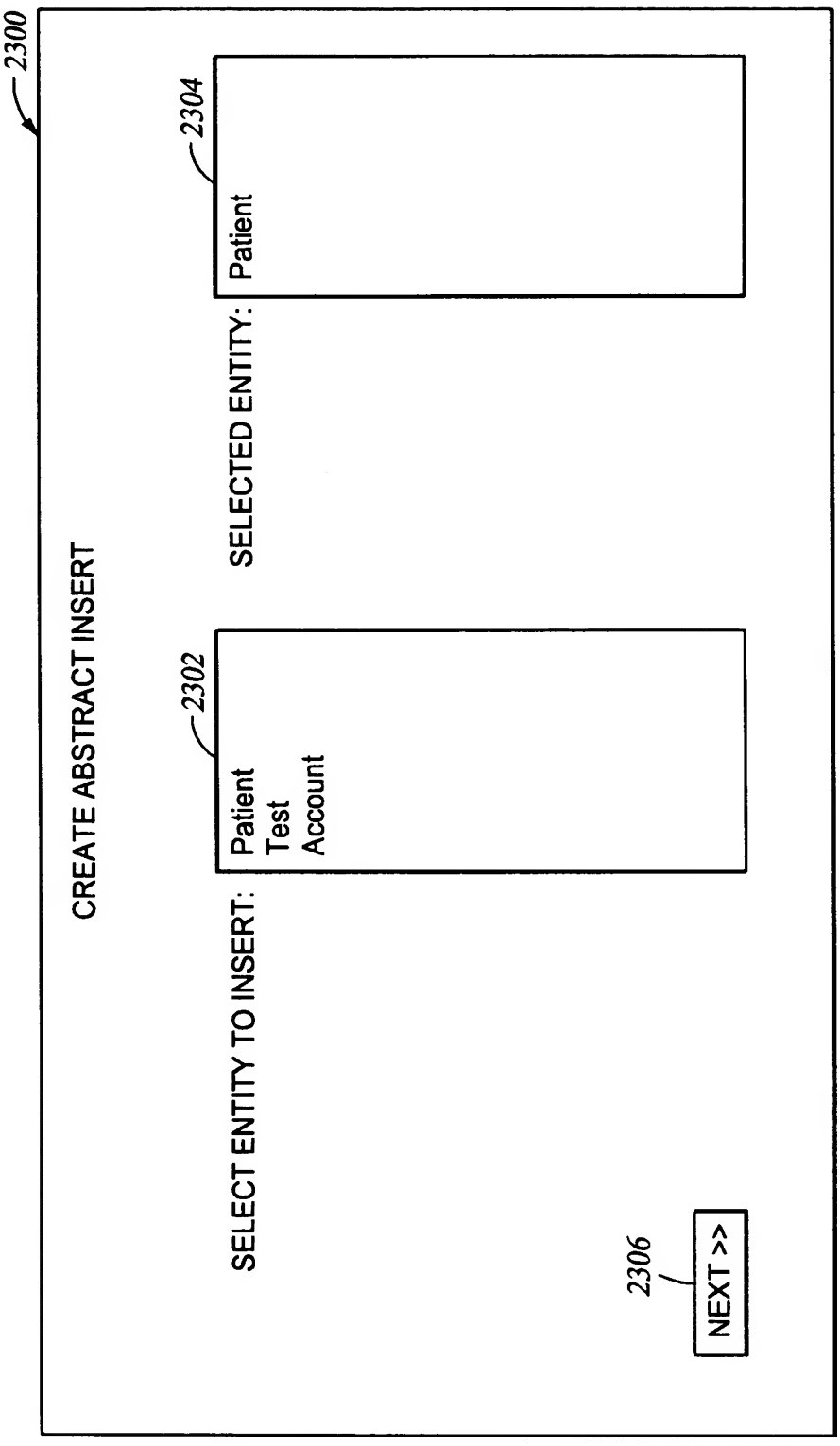

2300
CREATE ABSTRACT INSERT
SELECT ENTITY TO INSERT:
2302
Patient
Test
Account
SELECTED ENTITY:
2304
Patient
2306
NEXT >>

Fig. 24

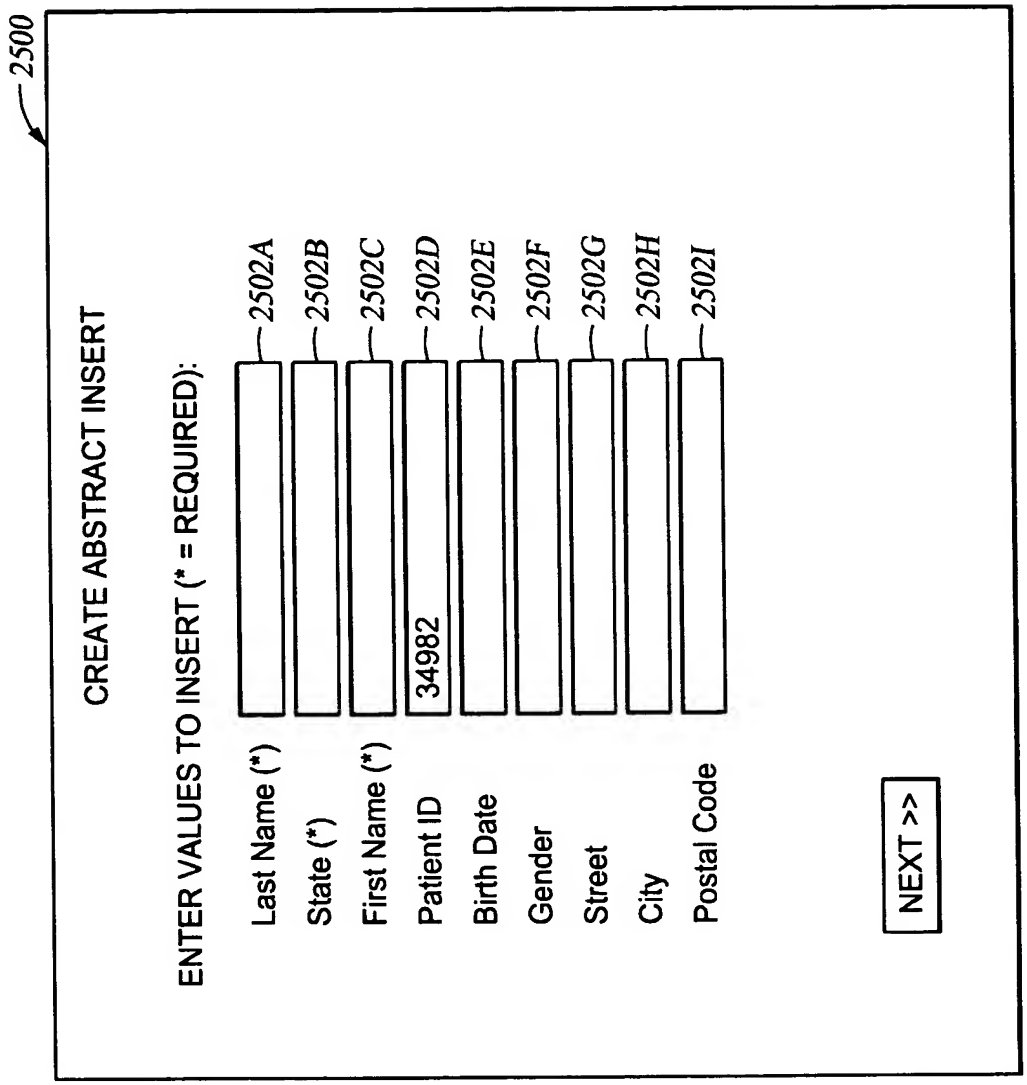

2500
CREATE ABSTRACT INSERT
ENTER VALUES TO INSERT (* = REQUIRED):
Last Name (*)
State (*)
First Name (*)
Patient ID
Birth Date
Gender
Street
City
Postal Code
34982
2502A
2502B
2502C
2502D
2502E
2502F
2502G
2502H
2502I
NEXT >>

Fig. 25

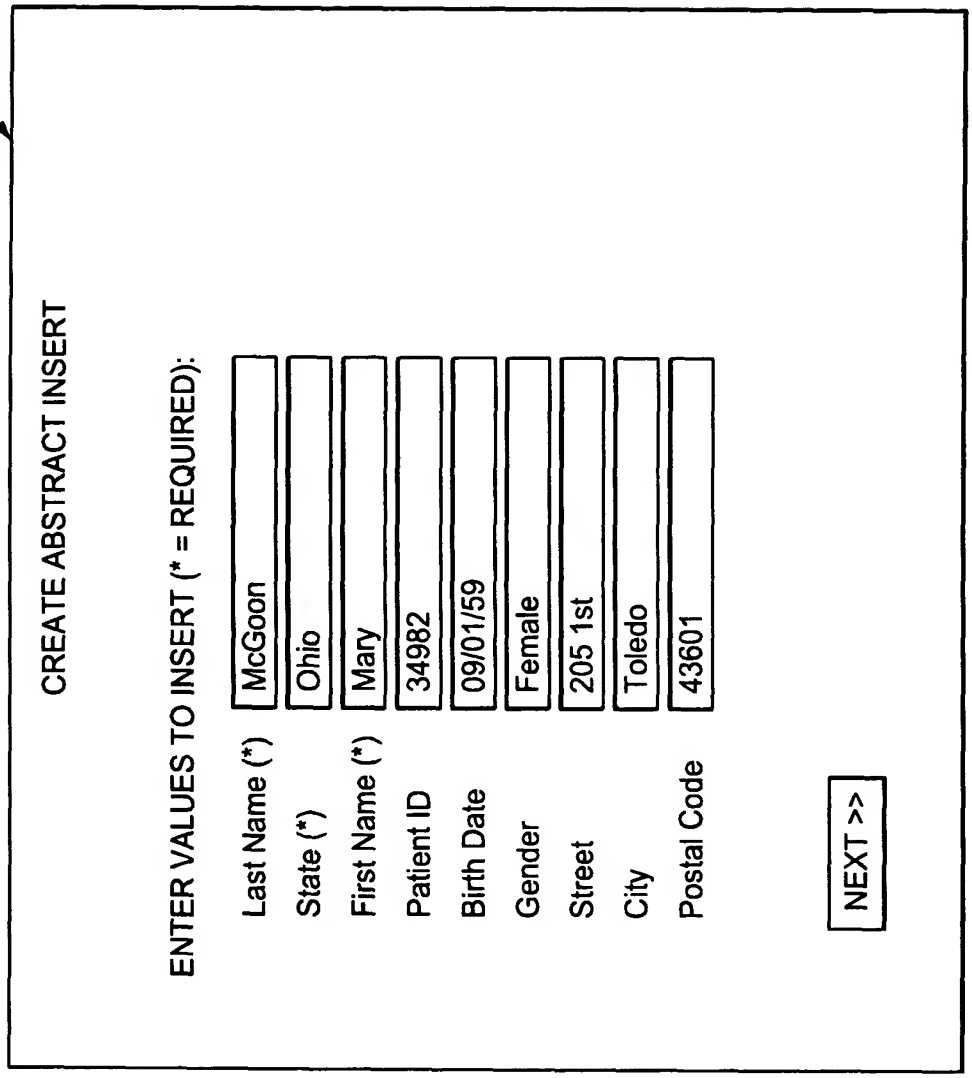

2500
CREATE ABSTRACT INSERT
ENTER VALUES TO INSERT (* = REQUIRED):
Last Name (*)
McGoon
State (*)
Ohio
First Name (*)
Mary
Patient ID
34982
Birth Date
09/01/59
Gender
Female
Street
205 1st
City
Toledo
Postal Code
43601
NEXT >>

Fig. 26

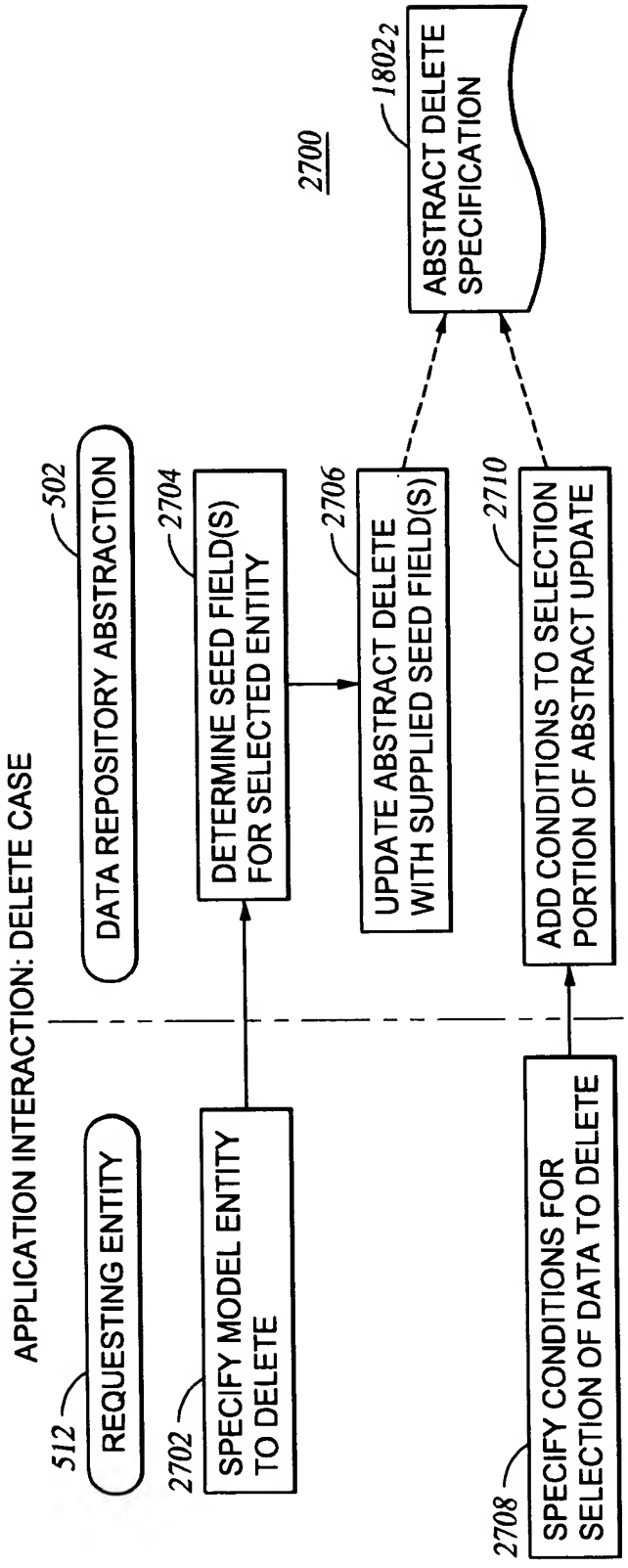

APPLICATION INTERACTION: DELETE CASE
512
REQUESTING ENTITY
502
DATA REPOSITORY ABSTRACTION
2702
SPECIFY MODEL ENTITY TO DELETE
2704
DETERMINE SEED FIELD(S) FOR SELECTED ENTITY
2706
UPDATE ABSTRACT DELETE WITH SUPPLIED SEED FIELD(S)
2708
SPECIFY CONDITIONS FOR SELECTION OF DATA TO DELETE
2710
ADD CONDITIONS TO SELECTION PORTION OF ABSTRACT UPDATE
2700
1802 2
ABSTRACT DELETE SPECIFICATION

Fig. 27

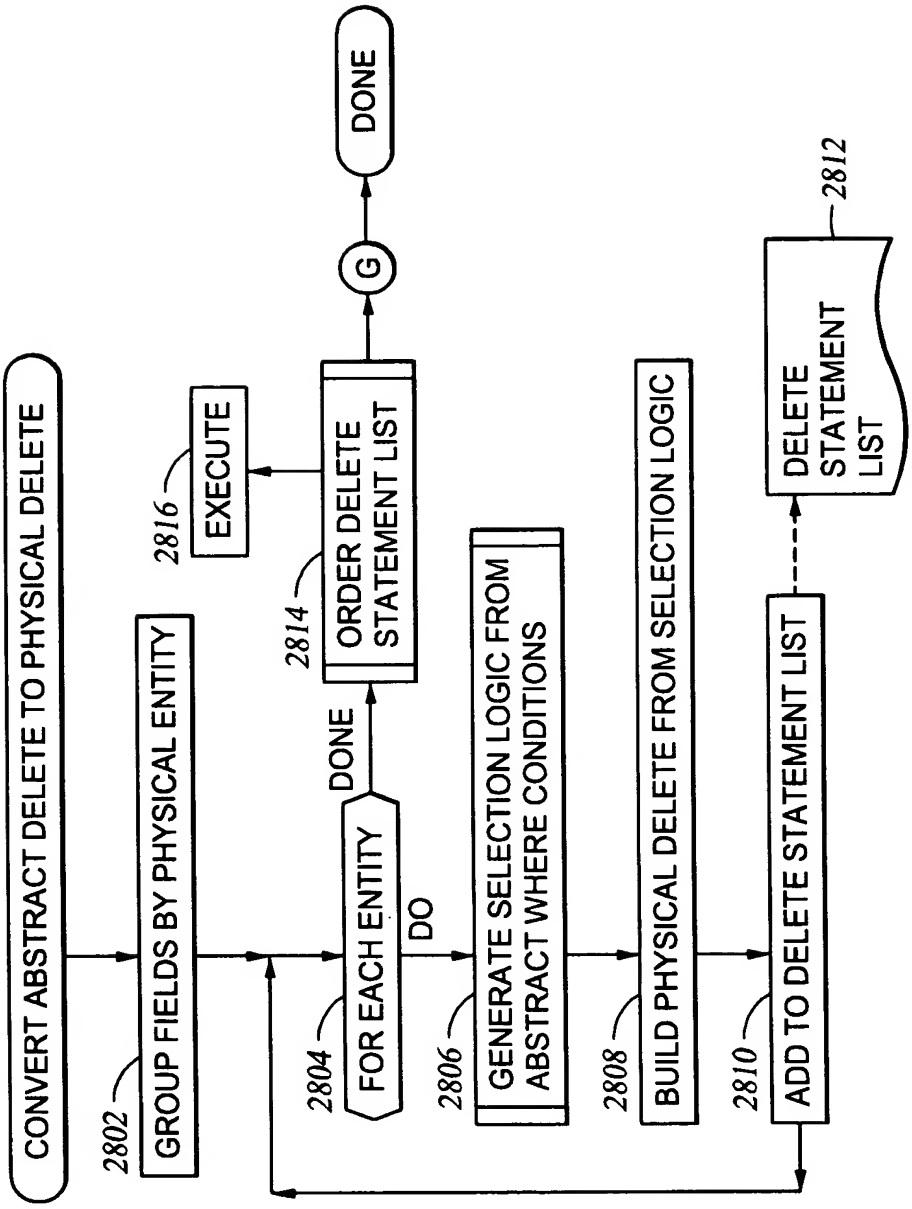

CONVERT ABSTRACT DELETE TO PHYSICAL DELETE
2802
GROUP FIELDS BY PHYSICAL ENTITY
2804
FOR EACH ENTITY
DO
DONE
2806
GENERATE SELECTION LOGIC FROM ABSTRACT WHERE CONDITIONS
2808
BUILD PHYSICAL DELETE FROM SELECTION LOGIC
2810
ADD TO DELETE STATEMENT LIST
2812
DELETE STATEMENT LIST
2814
ORDER DELETE STATEMENT LIST
2816
EXECUTE
G
DONE

Fig. 28

2800

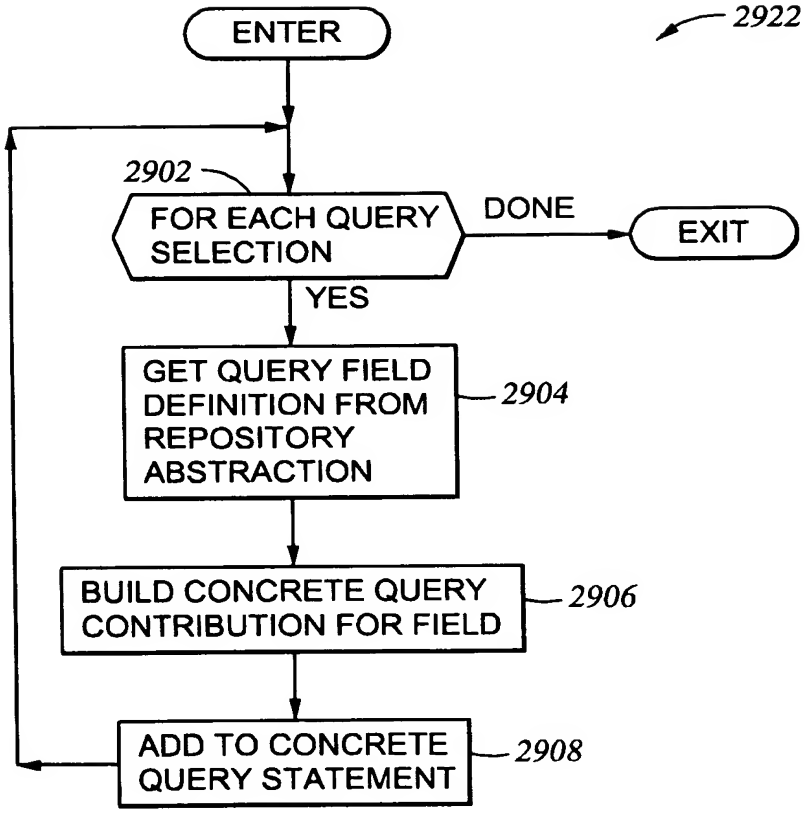
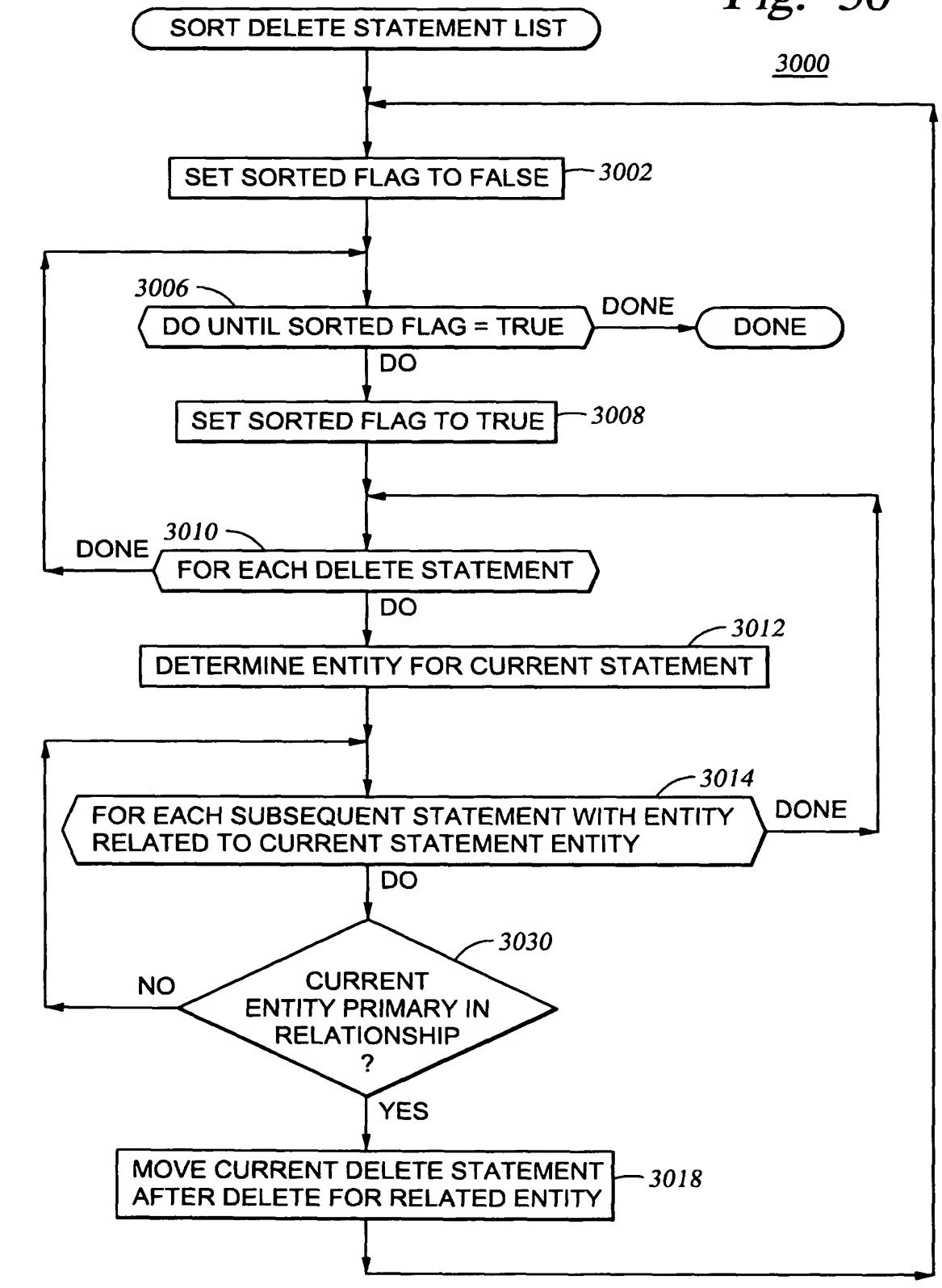

ENTER
2922
2902
FOR EACH QUERY SELECTION
DONE
EXIT
YES
GET QUERY FIELD DEFINITION FROM REPOSITORY ABSTRACTION
2904
BUILD CONCRETE QUERY CONTRIBUTION FOR FIELD
2906
ADD TO CONCRETE QUERY STATEMENT
2908

Fig. 29

Fig. 30


SORT DELETE STATEMENT LIST
3000
SET SORTED FLAG TO FALSE
3002
3006
DO UNTIL SORTED FLAG = TRUE
DONE
DONE
DO
SET SORTED FLAG TO TRUE
3008
3010
DONE
FOR EACH DELETE STATEMENT
DO
3012
DETERMINE ENTITY FOR CURRENT STATEMENT
3014
FOR EACH SUBSEQUENT STATEMENT WITH ENTITY RELATED TO CURRENT STATEMENT ENTITY
DONE
DO
3030
NO
CURRENT ENTITY PRIMARY IN RELATIONSHIP ?
YES
MOVE CURRENT DELETE STATEMENT AFTER DELETE FOR RELATED ENTITY
3018

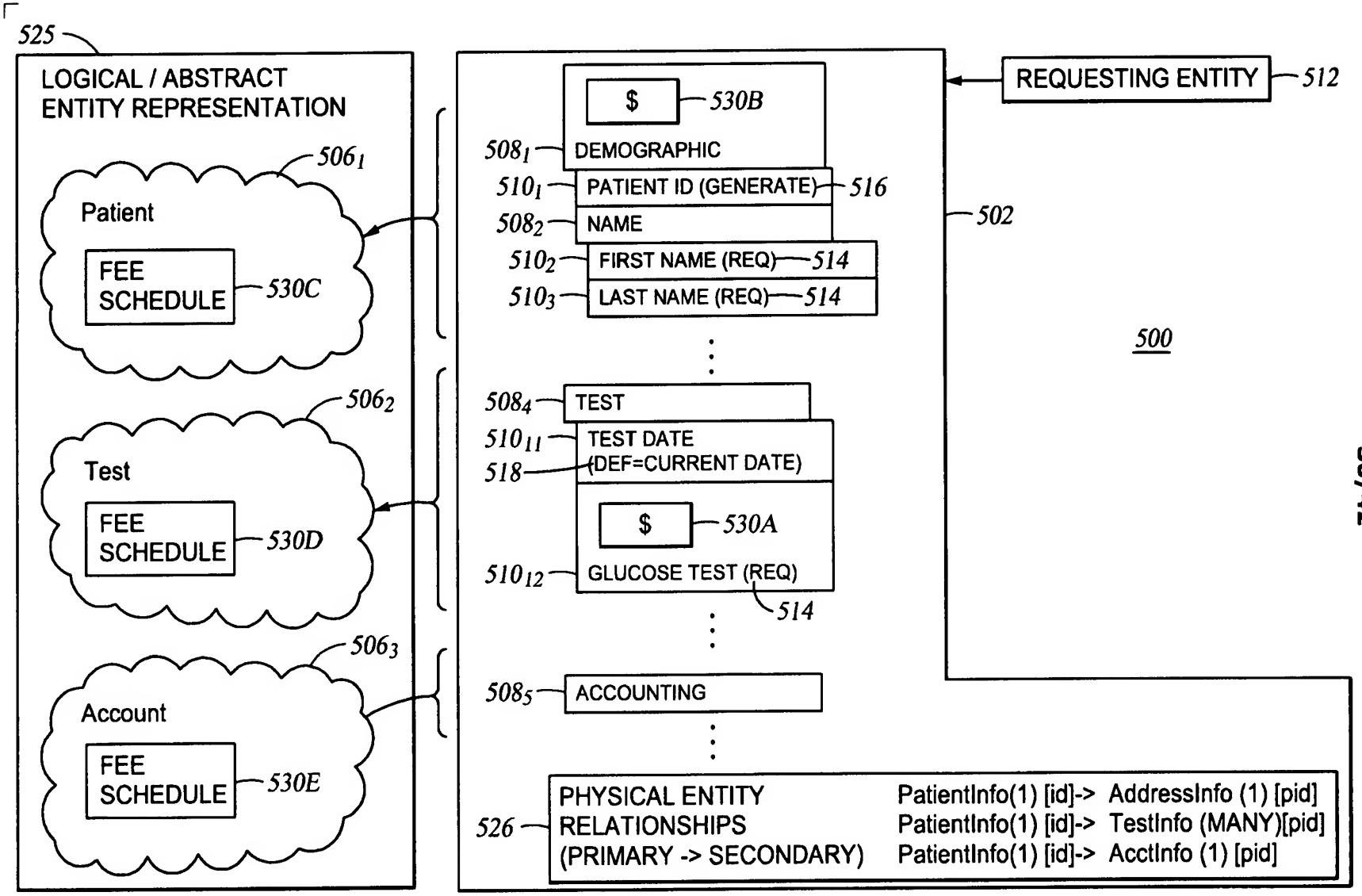


Fig. 31

ROC920030158US1

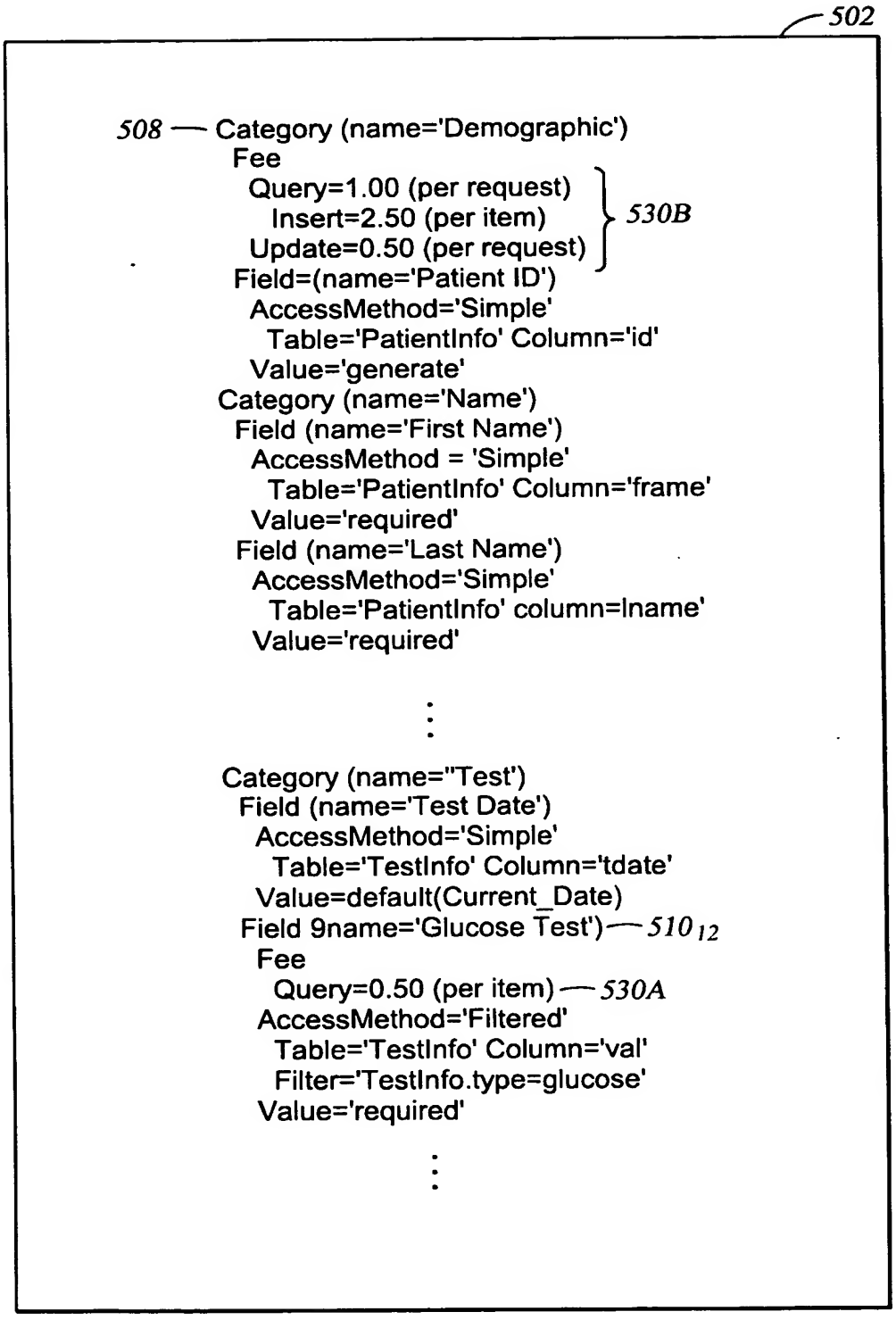

502
508
Category (name='Demographic')
Fee
Query=1.00 (per request)
Insert=2.50 (per item)
Update=0.50 (per request)
530B
Field=(name='Patient ID')
AccessMethod='Simple'
Table='PatientInfo' Column='id'
Value='generate'
Category (name='Name')
Field (name='First Name')
AccessMethod = 'Simple'
Table='PatientInfo' Column='frame'
Value='required'
Field (name='Last Name')
AccessMethod='Simple'
Table='PatientInfo' column=lname'
Value='required'
Category (name="Test')
Field (name='Test Date')
AccessMethod='Simple'
Table='TestInfo' Column='tdate'
Value=default(Current_Date)
Field 9name='Glucose Test')
510 12
Fee
Query=0.50 (per item)
530A
AccessMethod='Filtered'
Table='TestInfo' Column='val'
Filter='TestInfo.type=glucose'
Value='required'

Fig. 32

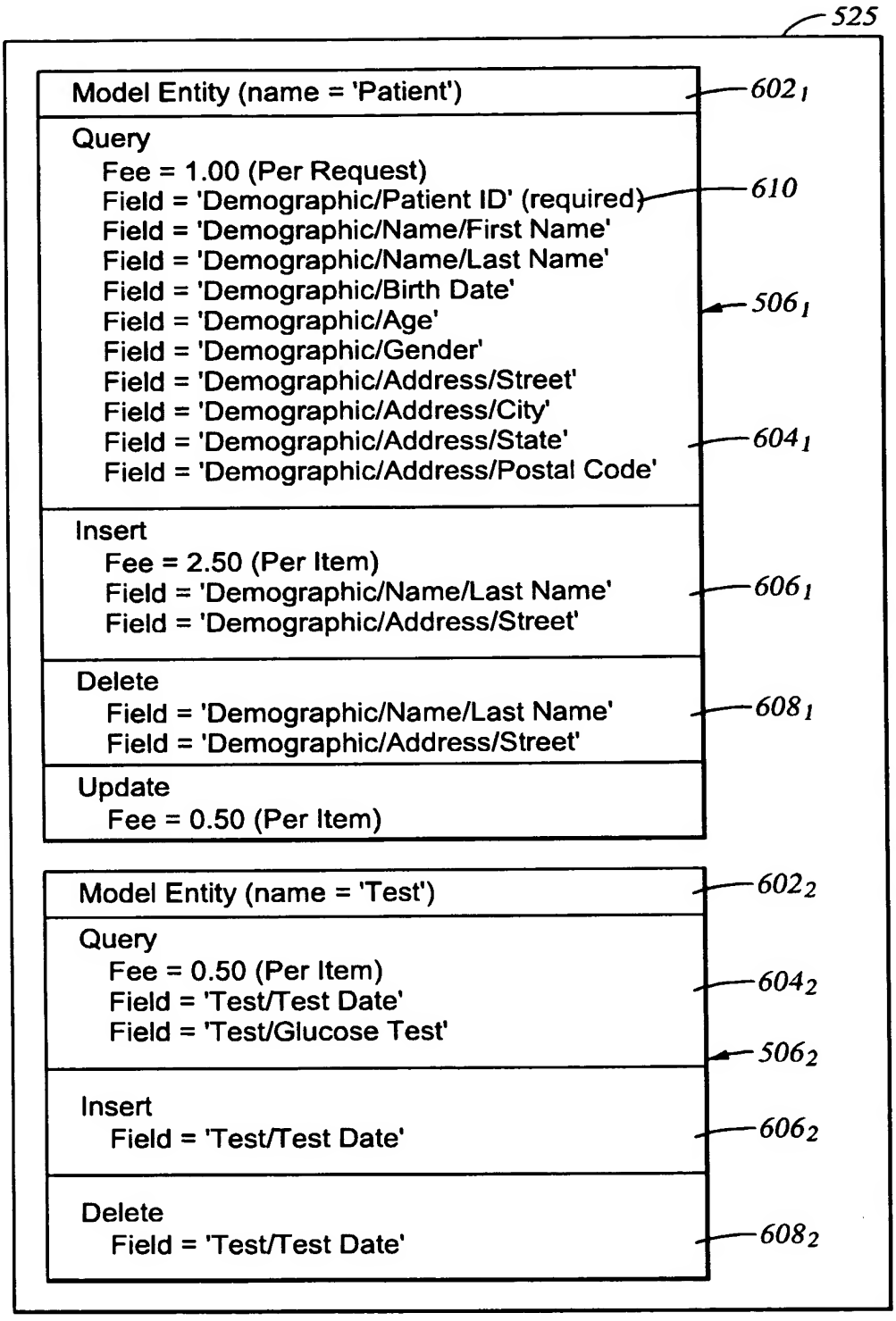
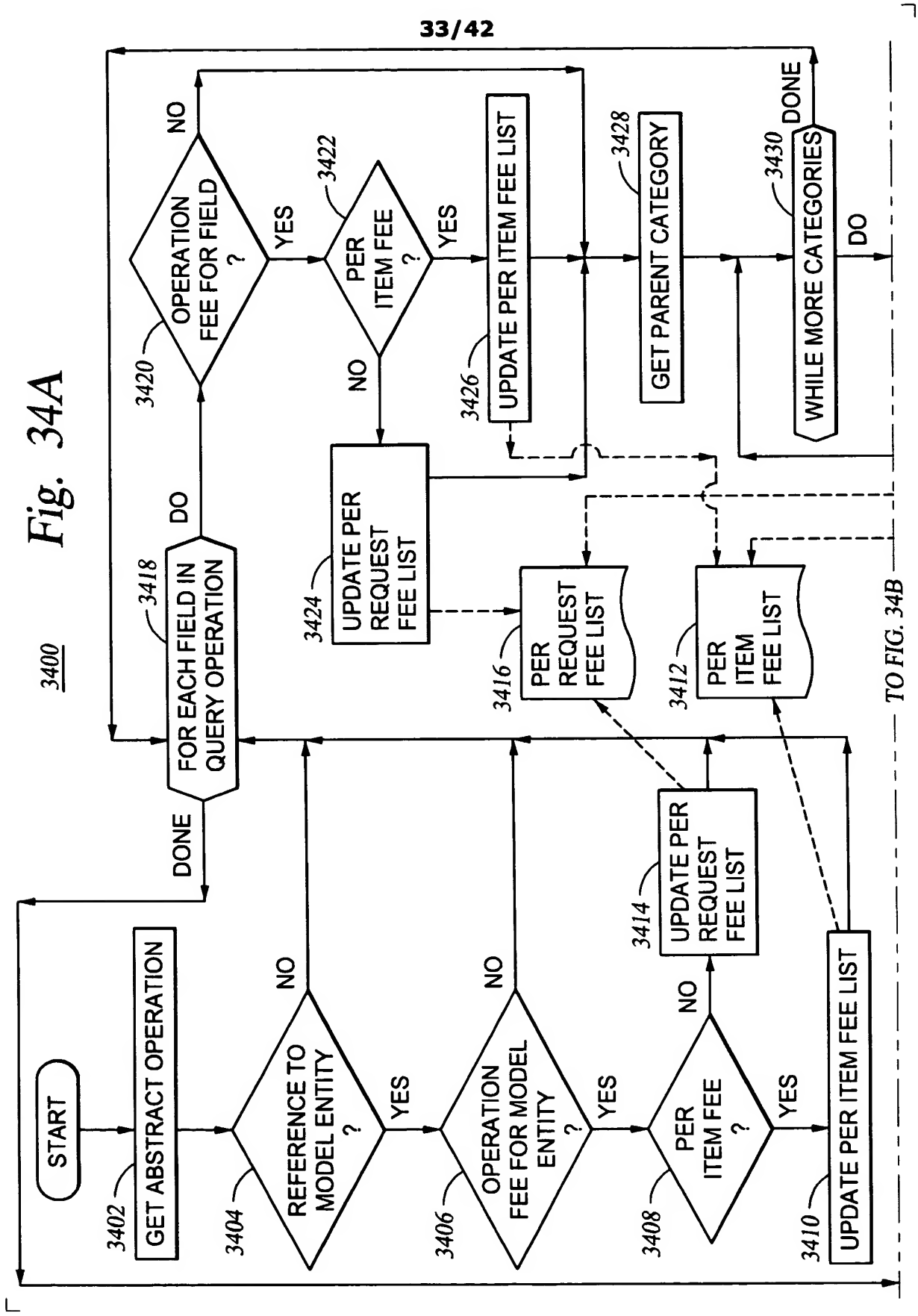

525
Model Entity (name = 'Patient')
602 1
Query
Fee = 1.00 (Per Request)
Field = 'Demographic/Patient ID' (required)
610
Field = 'Demographic/Name/First Name'
Field = 'Demographic/Name/Last Name'
Field = 'Demographic/Birth Date'
Field = 'Demographic/Age'
506 1
Field = 'Demographic/Gender'
Field = 'Demographic/Address/Street'
Field = 'Demographic/Address/City'
Field = 'Demographic/Address/State'
604 1
Field = 'Demographic/Address/Postal Code'
Insert
Fee = 2.50 (Per Item)
Field = 'Demographic/Name/Last Name'
606 1
Field = 'Demographic/Address/Street'
Delete
Field = 'Demographic/Name/Last Name'
608 1
Field = 'Demographic/Address/Street'
Update
Fee = 0.50 (Per Item)
Model Entity (name = 'Test')
602 2
Query
Fee = 0.50 (Per Item)
604 2
Field = 'Test/Test Date'
Field = 'Test/Glucose Test'
506 2
Insert
Field = 'Test/Test Date'
606 2
Delete
Field = 'Test/Test Date'
608 2

Fig. 33

Fig. 34A


3400
START
3402
GET ABSTRACT OPERATION
3404
REFERENCE TO MODEL ENTITY ?
NO
YES
3406
OPERATION FEE FOR MODEL ENTITY ?
NO
YES
3408
PER ITEM FEE ?
NO
YES
3410
UPDATE PER ITEM FEE LIST
3414
UPDATE PER REQUEST FEE LIST
3412
PER ITEM FEE LIST
3416
PER REQUEST FEE LIST
3418
FOR EACH FIELD IN QUERY OPERATION
DO
DONE
3420
OPERATION FEE FOR FIELD ?
NO
YES
3422
PER ITEM FEE ?
NO
YES
3424
UPDATE PER REQUEST FEE LIST
3426
UPDATE PER ITEM FEE LIST
3428
GET PARENT CATEGORY
3430
WHILE MORE CATEGORIES
DO
DONE
TO FIG. 34B

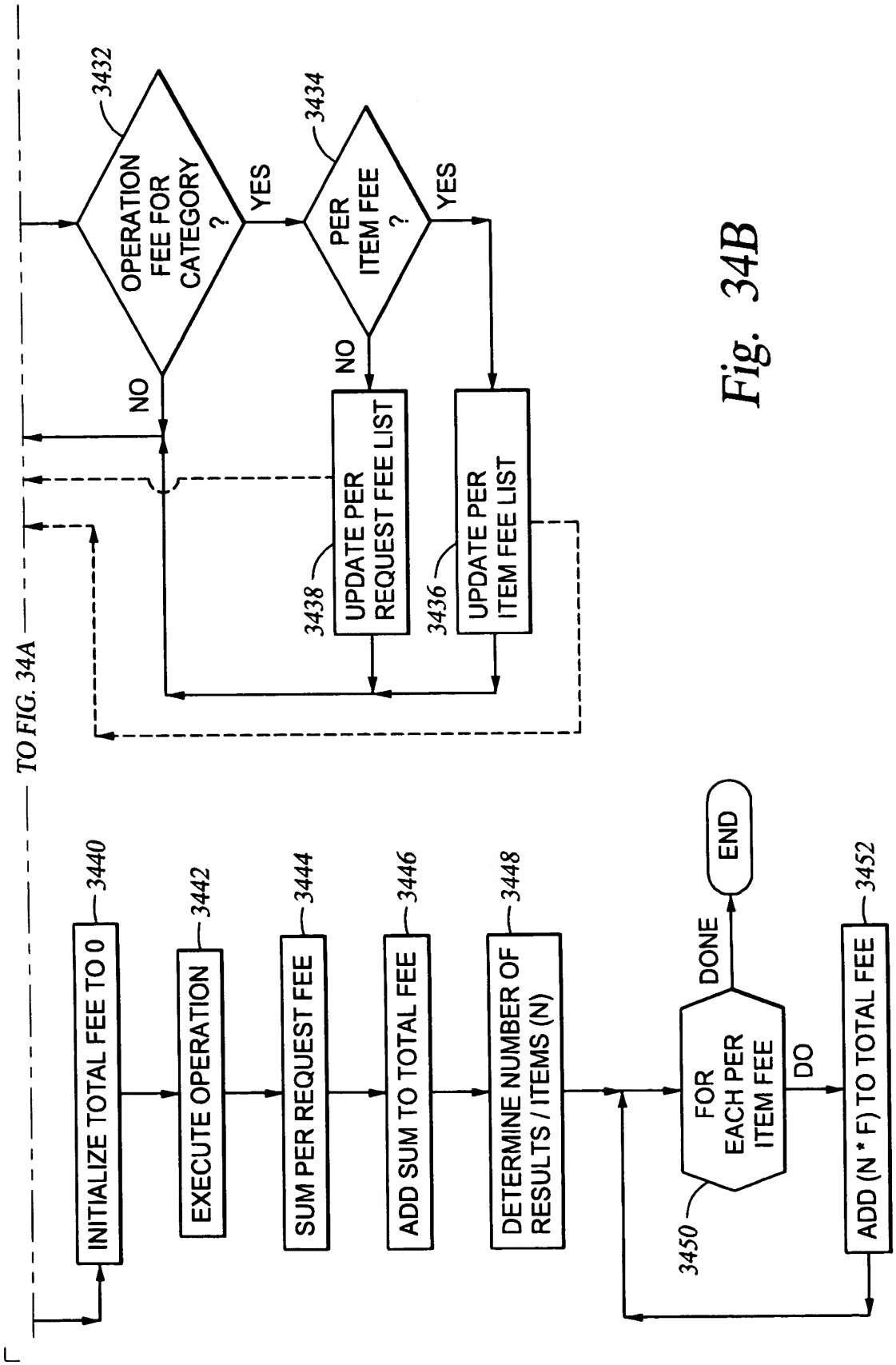
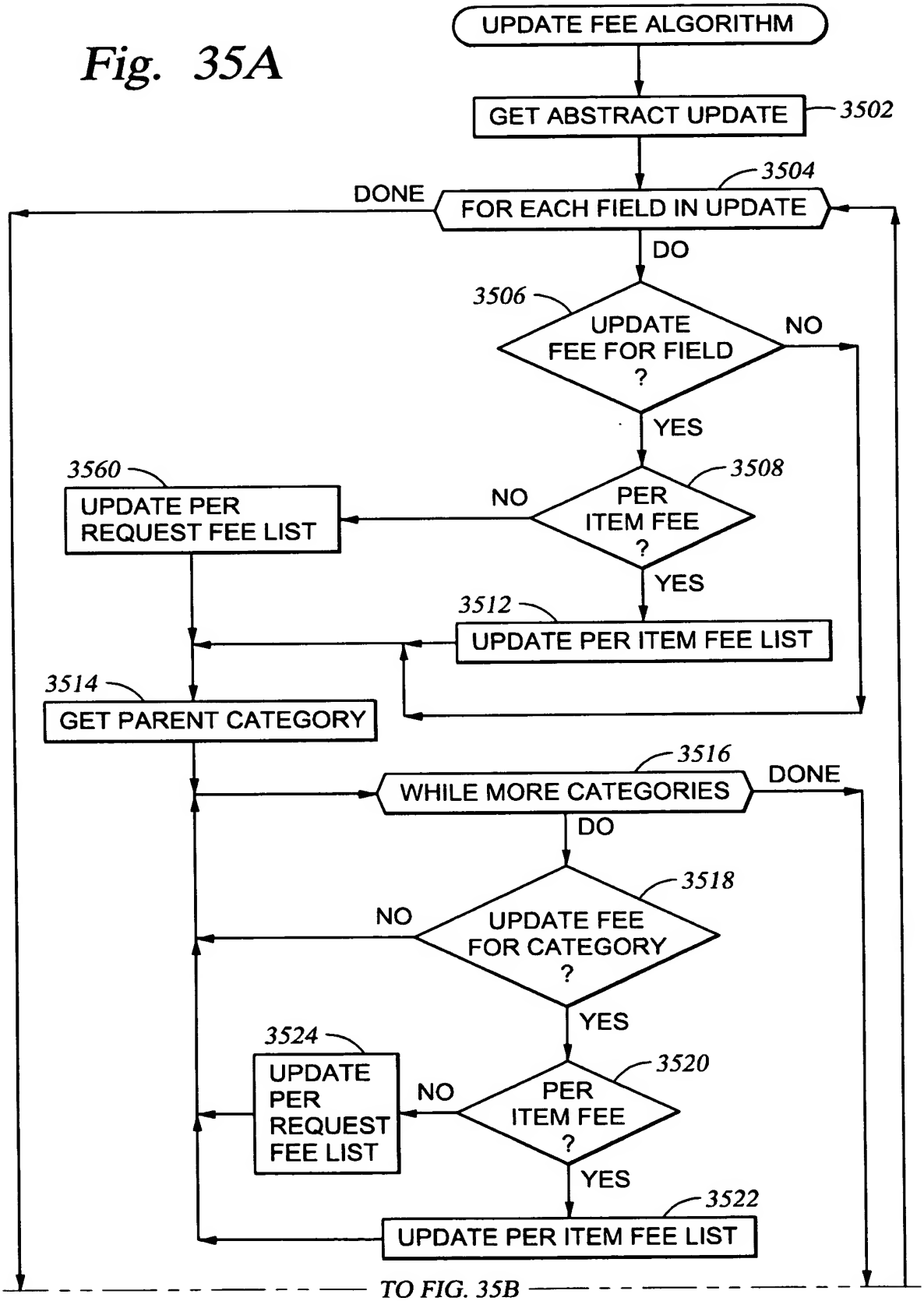

TO FIG. 34A
INITIALIZE TOTAL FEE TO 0
3440
EXECUTE OPERATION
3442
SUM PER REQUEST FEE
3444
ADD SUM TO TOTAL FEE
3446
DETERMINE NUMBER OF RESULTS / ITEMS (N)
3448
FOR EACH PER ITEM FEE
3450
DONE
END
DO
ADD (N * F) TO TOTAL FEE
3452
OPERATION FEE FOR CATEGORY ?
3432
NO
YES
PER ITEM FEE ?
3434
NO
YES
UPDATE PER REQUEST FEE LIST
3438
UPDATE PER ITEM FEE LIST
3436

Fig. 34B

Fig. 35A


UPDATE FEE ALGORITHM
GET ABSTRACT UPDATE
3502
3504
DONE
FOR EACH FIELD IN UPDATE
DO
3506
UPDATE FEE FOR FIELD ?
NO
YES
3560
UPDATE PER REQUEST FEE LIST
NO
3508
PER ITEM FEE ?
YES
3512
UPDATE PER ITEM FEE LIST
3514
GET PARENT CATEGORY
3516
WHILE MORE CATEGORIES
DONE
DO
3518
NO
UPDATE FEE FOR CATEGORY ?
YES
3524
UPDATE PER REQUEST FEE LIST
NO
3520
PER ITEM FEE ?
YES
3522
UPDATE PER ITEM FEE LIST
TO FIG. 35B

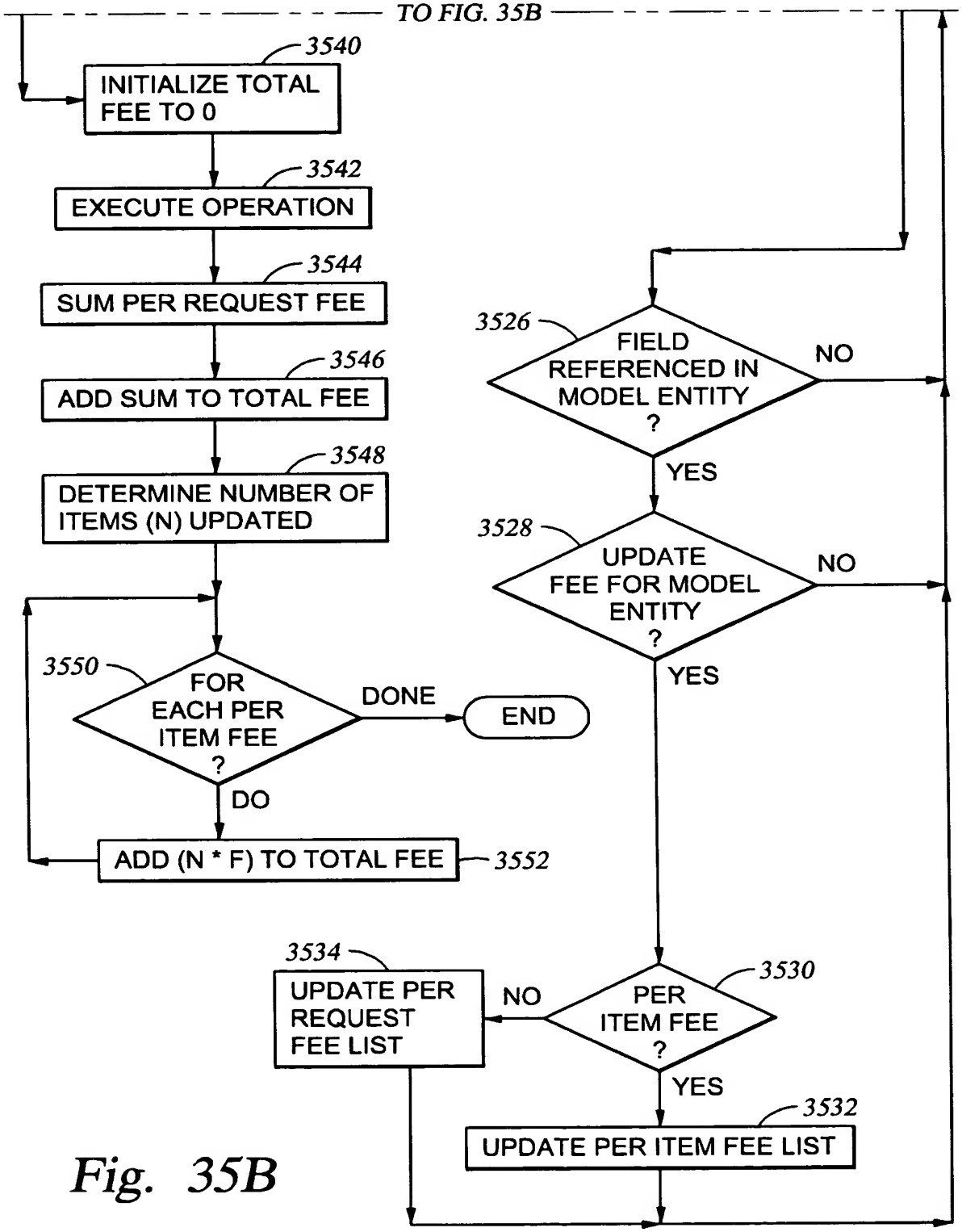

TO FIG. 35B
3540
INITIALIZE TOTAL FEE TO 0
3542
EXECUTE OPERATION
3544
SUM PER REQUEST FEE
3546
ADD SUM TO TOTAL FEE
3548
DETERMINE NUMBER OF ITEMS (N) UPDATED
3550
FOR EACH PER ITEM FEE ?
DONE
END
DO
ADD (N * F) TO TOTAL FEE
3552
3526
FIELD REFERENCED IN MODEL ENTITY ?
NO
YES
3528
UPDATE FEE FOR MODEL ENTITY ?
NO
YES
3534
UPDATE PER REQUEST FEE LIST
NO
3530
PER ITEM FEE ?
YES
3532
UPDATE PER ITEM FEE LIST

Fig. 35B

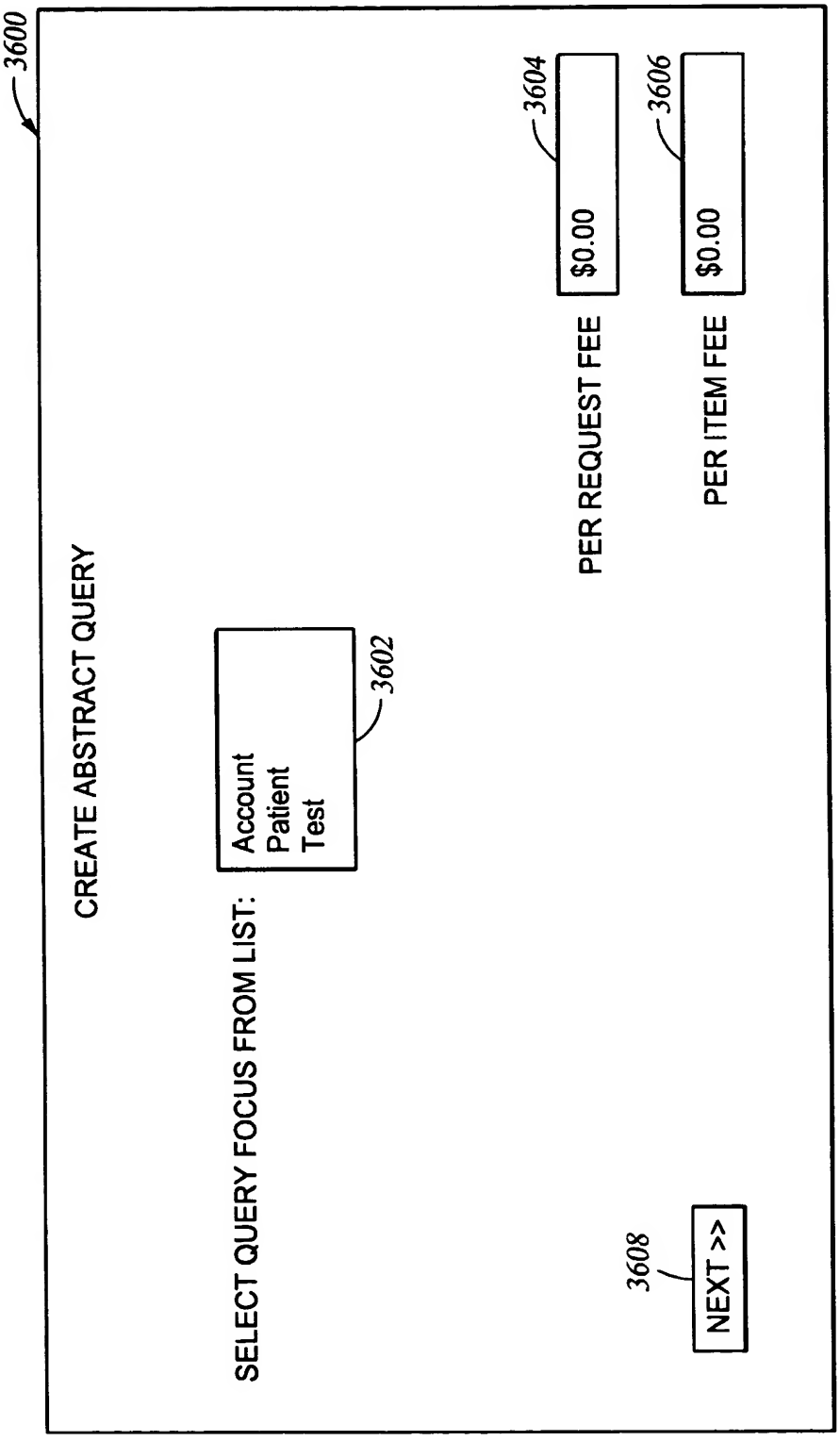

3600
CREATE ABSTRACT QUERY
SELECT QUERY FOCUS FROM LIST:
Account
Patient
Test
3602
3604
PER REQUEST FEE
$0.00
3606
PER ITEM FEE
$0.00
3608
NEXT >>

Fig. 36

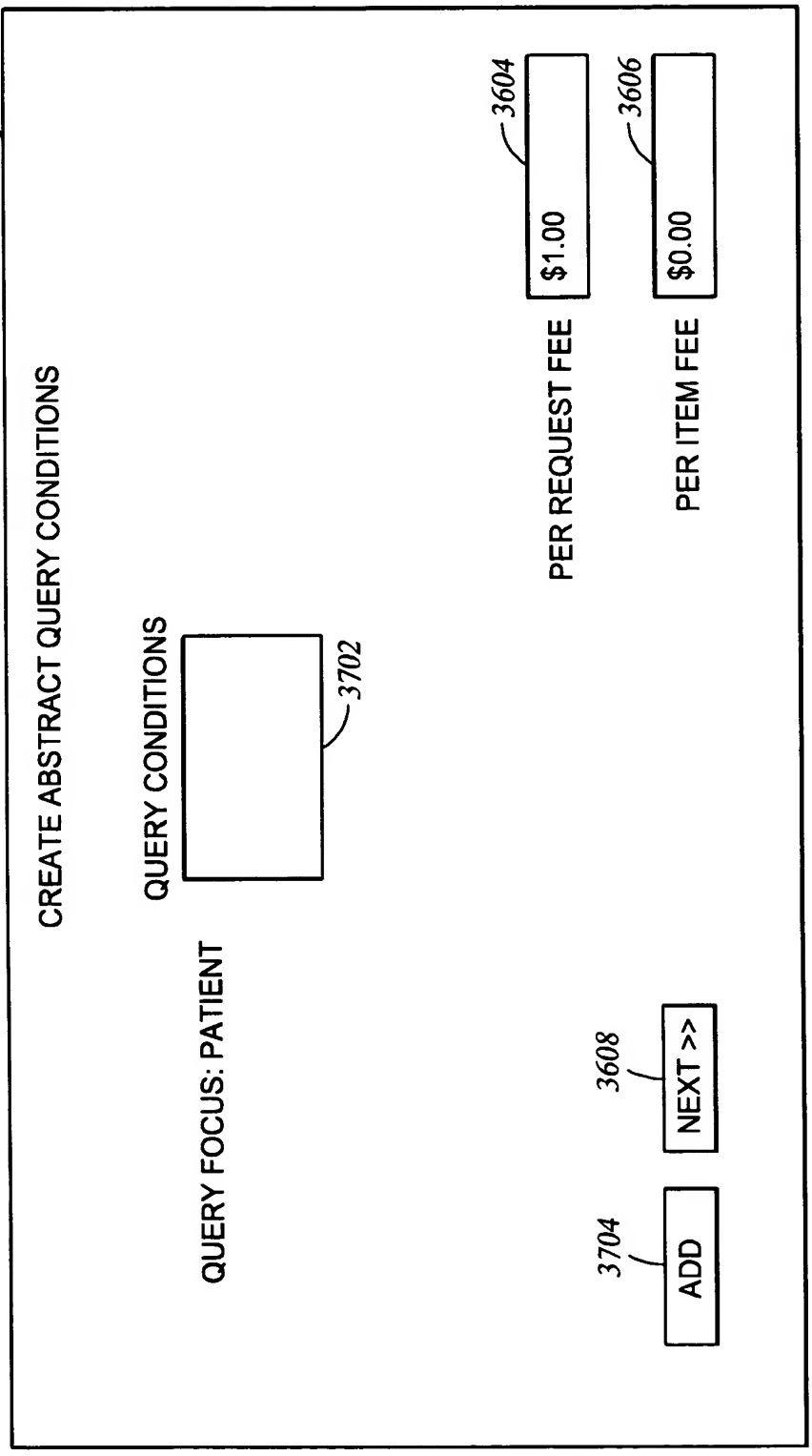

3700
CREATE ABSTRACT QUERY CONDITIONS
QUERY CONDITIONS
3702
QUERY FOCUS: PATIENT
3604
$1.00
PER REQUEST FEE
3606
$0.00
PER ITEM FEE
3608
NEXT >>
3704
ADD

Fig. 37

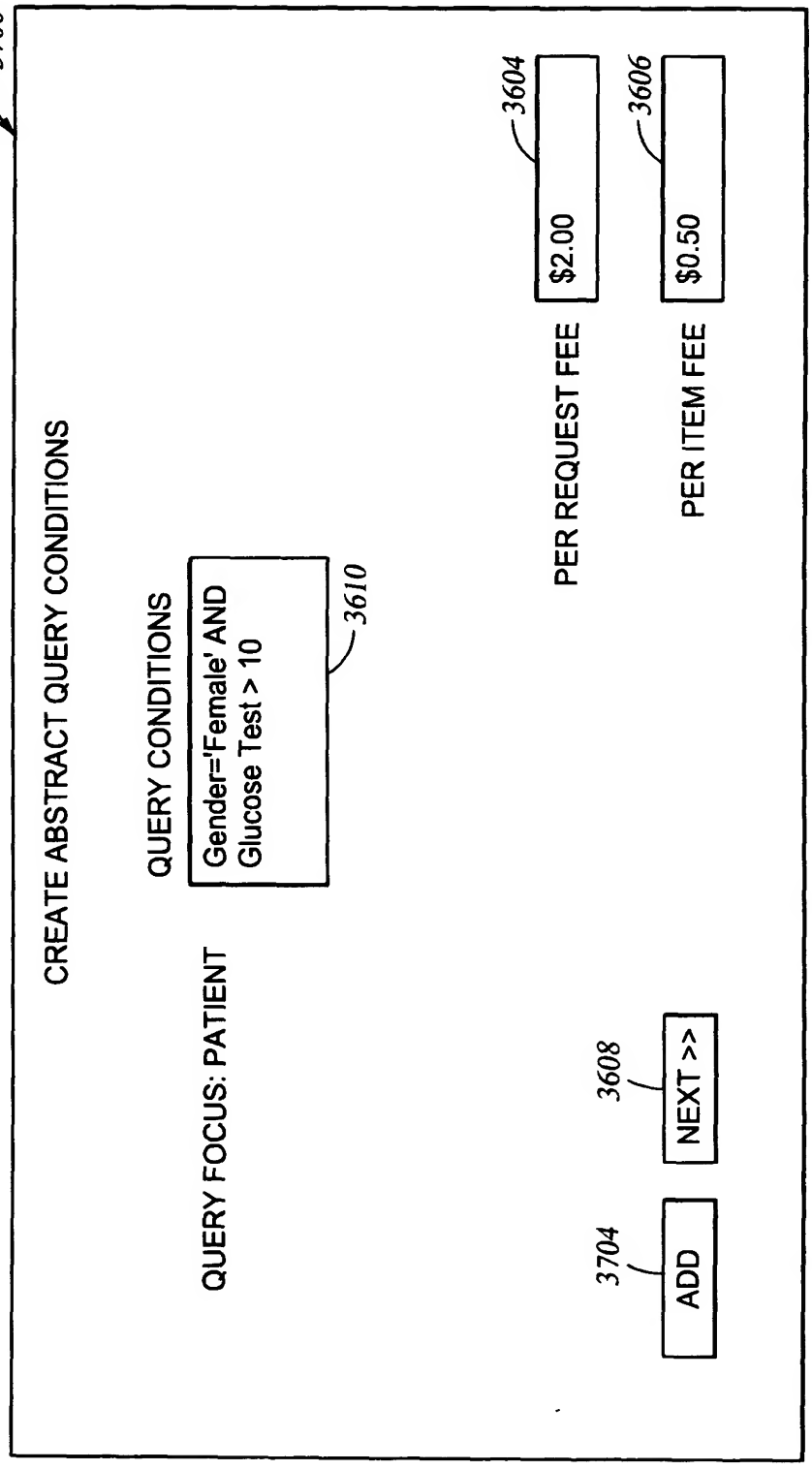

3700
CREATE ABSTRACT QUERY CONDITIONS
QUERY FOCUS: PATIENT
QUERY CONDITIONS
Gender='Female' AND
Glucose Test > 10
3610
PER REQUEST FEE
$2.00
3604
PER ITEM FEE
$0.50
3606
ADD
3704
NEXT >>
3608

Fig. 38

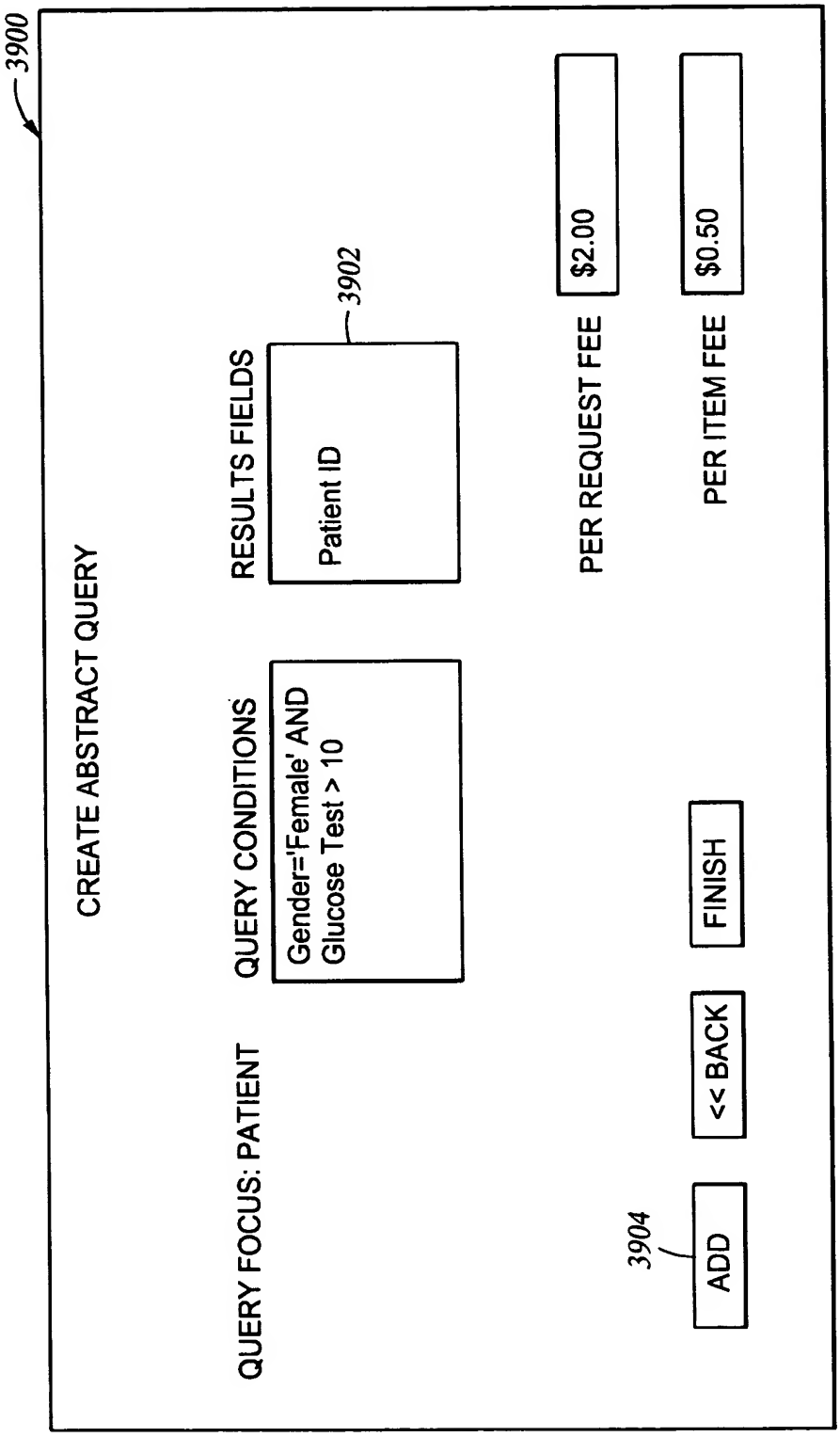

3900
CREATE ABSTRACT QUERY
QUERY FOCUS: PATIENT
QUERY CONDITIONS
Gender='Female' AND
Glucose Test > 10
RESULTS FIELDS
3902
Patient ID
PER REQUEST FEE
$2.00
PER ITEM FEE
$0.50
3904
ADD
<< BACK
FINISH

Fig. 39

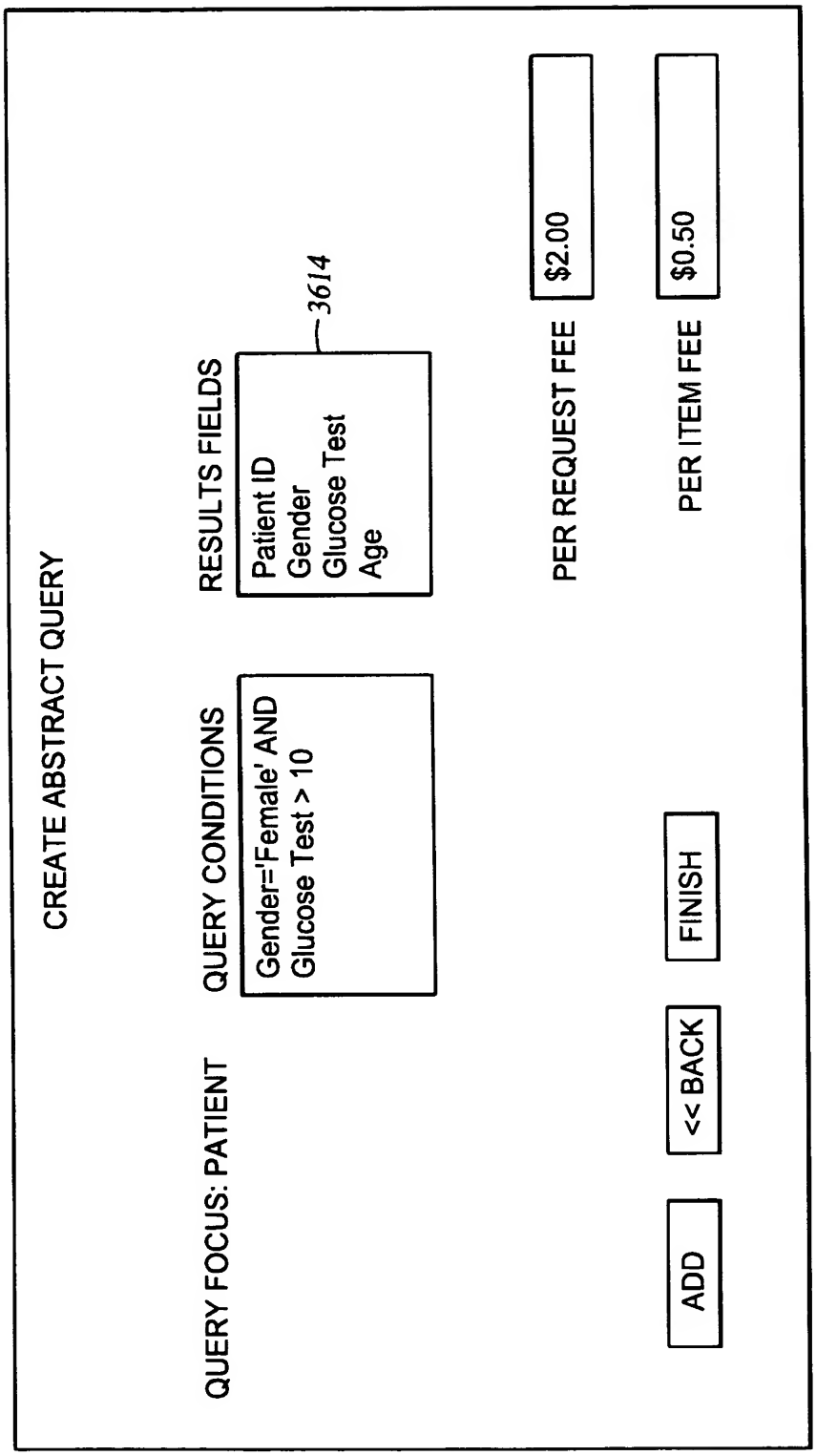

CREATE ABSTRACT QUERY
QUERY FOCUS: PATIENT
QUERY CONDITIONS
Gender='Female' AND
Glucose Test > 10
RESULTS FIELDS
Patient ID
Gender
Glucose Test
Age
3614
PER REQUEST FEE
$2.00
PER ITEM FEE
$0.50
ADD
<< BACK
FINISH

Fig. 40

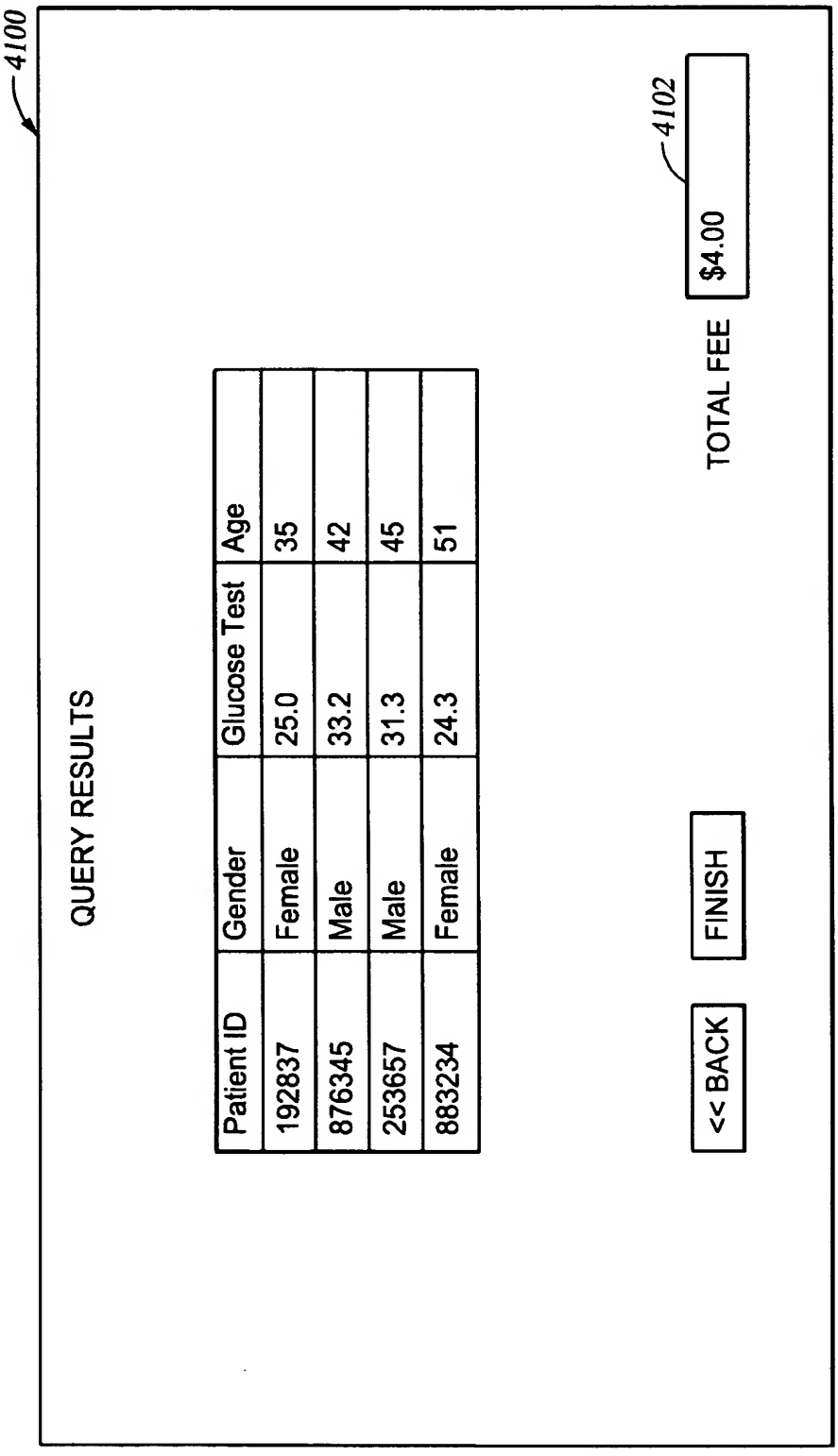

4100
QUERY RESULTS
Patient ID
Gender
Glucose Test
Age
192837
Female
25.0
35
876345
Male
33.2
42
253657
Male
31.3
45
883234
Female
24.3
51
4102
TOTAL FEE
$4.00
<< BACK
FINISH

Fig. 41